CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
REGIONAL WATER QUALITY CONTROL BOARD
LOS ANGELES REGION

Compliance Assessment of the Auto Dismantling Industry:

Evaluation of the California General Industrial Storm Water Permit

Final Report

March 2001

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I. EXECUTIVE SUMMARY

INTRODUCTION

Urban storm water is considered as one of the largest sources of pollution to the coastal waters of the United States. Storm drains convey runoff from streets, urban centers, industrial sites, and open spaces into streams, creeks, rivers, beaches, and the ocean. Industrial operations represent one contributor to storm water pollution, but they are known to be a major source of heavy metals, oily waste, and other substances. Many industrial operations involve manufacturing, storage, and shipping activities which, when conducted outside and are exposed to storm water, can be sources of pollutants in storm water.

Federal regulations issued pursuant to the 1987 amendments to the Clean Water Act mandate the regulation of point source discharges of storm water from industry and from municipal separate storm sewer systems serving 100,000 or more people. California, one of 44 states with delegated authority from the United States Environmental Protection Agency (EPA), implements its own storm water program. The State Water Resources Control Board (State Board) and the nine Regional Water Quality Control Boards (RWQCBs) are the state agencies charged with the primary responsibility for overseeing the implementation of storm water regulations in California. In 1991, State Board issued the Industrial Activities Storm Water General Permit (General Permit No. CAS000001; hereafter, GISP), subsequently reissued in 1997, to control pollutants associated with storm water runoff from industrial sources (GISP 1997). As of August 2000, approximately 9,200 industrial facilities in California were covered under the GISP, with nearly one-third of the facilities located in the Los Angeles region.

The overall goal of this study was to assess the effectiveness of the GISP program for one industrial sector, as implemented in the Los Angeles region, in reducing water quality impacts due to storm water pollution. This executive summary is divided into five sections: introduction, background, methodology, key findings, and conclusions. The background provides a general description of the objectives of the study. The methodology summarizes the approaches used in the study to fulfill the objectives. The key findings present highlights on important results. And the conclusions provide synthesis and recommendations based on the key findings.

BACKGROUND

The Los Angeles Regional Water Quality Control Board (the Los Angeles RWQCB) initiated this compliance assessment project in 1998, recognizing the need to adequately characterize the effectiveness of its industrial storm water program, as implemented at the facility level. The specific objectives of this study were: 1) to evaluate the state of compliance of one industrial sector, the auto dismantling industry, with the GISP requirements and associated water quality implications; 2) to identify limitations of the GISP program in effectively controlling pollutants in storm water runoff; and 3) to provide specific recommendations and regulatory alternatives to help guide management actions to improve water quality. This study is one of the few *comprehensive* assessments investigating the state of compliance of a particular industrial sector with storm water regulatory requirements.

This study chose to focus on the auto dismantling industry because the typical operational and material handling practices conducted by the facilities of this industry represent a potential significant source of conventional and toxic pollutants, including heavy metals and certain hydrocarbons, in storm water. Also, the industry represents a significant portion (about 15 percent) of the facilities covered in the Los Angeles RWQCB's GISP program.

For the purpose of evaluating compliance, this study categorized the GISP requirements into the following three tiers:

Initiation (Tier 1)
Facilities subject to coverage under the GISP, based on their standard industrial classification (SIC) codes or other specific conditions stated in the GISP, must file a Notice of Intent (NOI) with the State Board. (The auto dismantling industry with SIC code of 5015 has been mandated for coverage);

Documentation/Reporting (Tier 2)
Facilities must report their self-monitoring activities and results by submitting an Annual Monitoring Report by July 1st of each year. In addition, facilities must prepare an appropriate storm water document, known as Storm Water Pollution Prevention Plan (SWPPP), along with a written monitoring program to help guide their efforts in implementing appropriate storm water control measures and monitoring the quality of storm water runoff from their facilities.

On-site Implementation (Tier 3)
Facilities must implement appropriate storm water control measures known as Best Management Practices (BMPs) described in their SWPPPs and perform the required monitoring activities.

METHODOLOGY

The methods used to conduct this assessment include database analysis, in-depth document review, and onsite case study investigations.

Non-filer Identification
Auto dismantling facilities in Los Angeles County that have failed to apply for coverage under the GISP program by filing a NOI, also known as "non-filer", were characterized using the following sources of information: 1) a list obtained from the California Department of Motor Vehicles, Occupational Licensing Division (DMV) of auto dismantling facilities in Los Angeles County that maintain a current dismantling license issued from the DMV, and 2) results from the door-to-door site visits conducted

by the City of Los Angeles inspectors from January 1999 to May 2000, specifically aimed at identifying non-filers in parts of Los Angeles city. Facility names and addresses were screened using the Los Angeles RWQCB's NOI database to verify their status of coverage under the GISP.

Document review
A detailed review of SWPPPs and written Monitoring Programs was completed for a study pool of 52 auto dismantling facilities. The purpose of the review was to assess the effectiveness of these storm water documents in guiding facility operators into compliance. The 52 facilities were selected randomly from the NOI database using a systematic, replicable process and are considered to be representative of the industry.

Case study investigations
Site inspections and storm water sampling were performed on the nine selected auto dismantling facilities located in San Gabriel River and Los Angeles River watersheds. The nine facilities were selected out of the study pool of 52 facilities, based on their proximity to the San Gabriel River watershed, the Los Angeles RWQCB's priority watershed for the 1999/00 fiscal year.

The purpose of these site-specific investigations was to take a hard look at the onsite component of compliance that may not be readily observable from document review alone. Storm water analytical data were used to evaluate the quality of storm water runoff generated, impact of the BMPs implemented on water quality, and a simple load calculation for the industry. The EPA Simple Method was used to estimate load.

KEY FINDINGS

The following highlights the important findings of this study:

Initiation (Tier 1)

<u>Non-filer Identification</u>
The problem of non-filers among auto dismantling facilities is significant. An assessment based on the DMV list revealed that one out of every five facilities with a valid DMV license was operating as a non-filer. The site visit results indicated a more serious degree of non-compliance for certain parts of Los Angeles city, with more than one-third (37%) of the auto dismantling establishments visited operating without a NOI.

A possible explanation for such a high ratio of non-filers observed from the site visit results- almost twice as that predicted by the DMV analysis- is that some areas of Los Angeles County, including the locations targeted by the City inspectors, potentially have a disproportionately high percentage of non-filers. Also, site visits can account for non-filers that may be operating without a valid dismantling license, thus not included in the DMV database. The actual number of non-filers in Los Angeles County could be somewhat or considerably higher than that predicted by the DMV/NOI analysis (perhaps somewhere between 19% and 37%), considering an unknown number of delinquent facilities operating with neither a dismantling license nor a NOI.

Documentation/Reporting (Tier 2)

Annual (Monitoring) Reports

Since the 1995/96 permit year, the proportion of the 52 selected facilities submitting Annual Reports has been steadily rising, with a peak submittal rate of 96% observed for the two most recent years considered by this study- 1997/98 and 1998/99. This is a significant increase in compliance, considering that less than half complied with the annual reporting requirement in some of the earlier years. Accelerated efforts expended by the Los Angeles RWQCB in outreach and enforcement activities, fueled by legislation such as Assembly Bill 2019 that mandates timely enforcement actions against violators of the GISP requirements, appear to have significantly contributed to an increased compliance.

SWPPPs/Written Monitoring Program

Initially when the Los Angeles RWQCB issued letters requesting for SWPPPs, nearly a quarter of the facility operators responded with phone calls, displaying little or no knowledge of the SWPPP requirement. Following the initial responses, most facilities (50 out of the 52 requested) did submit their SWPPPs and their written monitoring programs to the RWQCB (Formal enforcement actions were taken against the two delinquent facilities for their failure to submit the requested SWPPPs and past Annual Reports.)

This study found nearly all of the SWPPPs to be deficient in more than one area. The majority were boiler-plate documents prepared by consultants that lacked sufficient site-specific and/or procedural details crucial for proper implementation of BMPs. Many SWPPPs provided sets of "ideal" or "proposed" BMPs but were vague about specifying the measures that were chosen for implementation by the facility operator. BMPs considered universally applicable and important for pollution prevention, such as employee training, site inspection, and good housekeeping programs, were missing from a considerable number of the SWPPPs reviewed.

The majority of the written monitoring programs were prepared by consultants and contained many of the deficiencies found in the SWPPPs. Most documents failed to provide sufficient procedural details necessary to ensure proper quality assurance and quality control (QA/QC), especially regarding sample collection, storage, handling, and transport procedures.

On-site Implementation

BMPs

Staff inspections of the nine case study facilities revealed that the facilities were not fully implementing the BMPs outlined in their SWPPPs, especially measures that are more cost- and/or effort– intensive. Judging from the extent of spills and leaks observed on facility ground, it was evident that the existing BMPs, at the level implemented at most of the facilities, were not adequately controlling the pollutant sources present onsite. Some BMPs such as providing an overhead coverage for dismantling areas or storing motor parts in an enclosed area were limited in their effectiveness because dismantling and storing activities were commonly conducted outside of the designated areas due to inadequate workspace or other physical constraints. One facility eliminated the exposure of vehicle parts to storm water by storing them in large autobodies. An example of an innovative, cost-effective BMP that was implemented unsuccessfully at many of the selected facilities was using truckbeds to store vehicle parts. The facilities that used truckbeds for parts storage had failed to seal the cracks in the truckbeds to prevent potential leaks.

One factor that could potentially obscure a facility operator's assessment of compliance is the lack of a clear standard of compliance in the permit; GISP specifies neither a specific set of required BMPs nor a quantifiable performance or pollutant level to be achieved. (Many of the RWQCBs' staff members use and encourage the permittees to use a set of parameter benchmark values from the USEPA's "Final National Pollutant Discharge Elimination System Storm Water Multi-Sector General Permit for Industrial Activities" (most recently reissued in 2000) for the purpose of gauging potential harm or impact on water quality. However, these benchmarks are not specified in the GISP and are typically not used for gauging compliance or for enforcement purposes.)

Facility Self-monitoring

Review of the Annual Reports submitted by 50 of the 52 selected facilities indicated that the degree of compliance with the monitoring requirements did not match the success observed with submitting the monitoring reports. Based on our review of the 1997/98 Annual Reports, less than 20% of those required successfully completed the sampling & analysis requirement. Not all facilities that collected samples analyzed for the required toxic constituents (lead, zinc, and copper). Less than half conducted the monthly visual observation of storm water runoff. Despite the deficiencies in their monitoring activities, many facility operators still self-certified their Annual Reports for compliance.

Water Quality Impacts

Storm Water Sampling and Analysis

There was a wide range in the concentrations of pollutants in storm water samples obtained from the eight (out of the nine) case study facilities. The majority of the storm water analytical data exceeded the USEPA benchmark levels, in particular, for metals and oil & grease. The general trend identified in this study is that facilities that diligently implemented BMPs, especially good housekeeping practices, and had an overall neat and organized site appearance generally had lower pollutant concentrations in their storm water samples, as expected.

Load

A simple load calculation for 1998/99 suggested the following range for pollutant loads in storm water runoff from the auto dismantling industry in Los Angeles County: 30,570 lbs. of total suspended solids, 7,460 lbs. of oil & grease, 40 lbs. of copper, 30 lbs. of lead, and 130 lbs. of zinc.

CONCLUSIONS/RECOMMENDATIONS

- There is still a substantial number of auto dismantling facilities that need to be identified and permitted under the GISP program. A combined approach using currently available databases supplemented by site visits appears to be an effective method for capturing non-filers. The existing agreement between DMV and the State Board offers a good example of interagency cooperation that helps to elucidate the non-filer identification process-- a model that could be applied to other industrial sectors, including but not limited to the transportation and recycling industries. At this time, additional information is needed to evaluate if the quality of storm water from the non-filers is significantly different, on average, from the permitted facilities.

- In general, the level of understanding among the auto dismantling facility operators of the intent and the significance of the GISP program and its requirements appeared to be low when this study was conducted.

- Compliance among many auto dismantling facilities was achieved mostly on paper, primarily reflected in the quantity of the required documents or reports submitted to the agency and perhaps less in terms of the quality. Site inspections revealed that the degree of field compliance achieved through proper implementation of appropriate BMPs is low and trails behind paper compliance.

- In light of the fact that it is only the field implementation component that substantively contributes to pollution reduction and given the high levels of oil & grease and metals found in storm water runoff from auto dismantling facilities, it may be concluded that the GISP program, as currently implemented by many auto dismantling facilities, does not appear effective in controlling storm water pollution.

- Despite an increase in compliance with the annual reporting requirement, incomplete monitoring results, especially the analytical data, limit the usefulness of the Annual Reports in developing a comprehensive data inventory needed to: fully assess the quality of runoff from regulated facilities; measure progress in pollution prevention efforts over the years; assess water quality impacts from industrial storm water runoff based on load estimates; and develop water quality standards, including total daily maximum loads (TMDLs). To improve both the compliance with monitoring requirements and the quality of the Annual Reports being submitted, the RWQCB must step up its efforts to provide timely responses, for compliance assistance and enforcement purposes, when deficiencies are noted.

- Many of the storm water documents - SWPPPs and written monitoring programs- failed to serve as useful guides for facility operators in the selection and implementation of appropriate BMPs and in monitoring activities due to the absence of sufficient procedural and site-specific details. A time-efficient solution recommended by this study is to target those the consultants (who work closely with the industry as a group monitoring leader or prepare storm water documents on behalf of the facilities) for regular training, education, and certification to ensure that SWPPPs and written monitoring programs prepared by third parties are up to par with the GISP requirements.

- One factor that potentially obscures the efforts of facility operators and regulators in assessing compliance is the lack of explicit, quantifiable standards that facilities must attain in order to demonstrate compliance with the GSIP requirements and with applicable water quality standards. Determination of compliance should not be left up to the subjective interpretation of uninformed permittees or regulators. Thus, the GISP program needs a more clear-cut standard of compliance based on a combination of a minimum set of specific BMPs and/or numerical effluent limitations. The following tiered approach is recommended for the auto dismantling industry: 1) a mandatory set of specific, baseline structural (excluding treatment) and non-structural BMPs for facilities with annual vehicle throughput less than 500 (which includes mom-and-pop and medium-sized facilities); and 2) mandatory treatment of storm water for facilities with annual vehicle throughput greater than 500. (Note: The annual volume of vehicles processed at many of the mom-and-pop facilities, which make up over three-quarters of the industry in the Los Angeles Region, is less than 300 vehicles. The threshold of 500 vehicles was chosen to include typical mom-and-pop and medium-sized facilities in the Region). Also, in lieu of requiring treatment, numerical effluent limitations could be applied to the latter group as a standard of compliance. A compliance schedule could help phase facilities into compliance over a certain specified timeframe. Facilities with less than 500 annual vehicle throughput that persistently demonstrate problems with meeting a certain water quality standard, e.g. the USEPA benchmark levels, should also be considered for inclusion in the mandatory storm water treatment category.

- The lack of sufficient resources was identified as the primary reason for the limited compliance assurance and enforcement activities performed by the RWQCB in the past and when this study was being conducted. One way to reduce the workload associated with assessing compliance of industries subject to the GISP requirements is to employ a semi-privatized certification program, such as that implemented in the State of Wisconsin, that relies on licensed, private inspectors to oversee the compliance activities of a group of facilities that voluntarily choose to participate and help fund the program. The aim of such a program is to help reduce some of the workload of the regulators and to allow facilities that diligently work toward and maintain a specified level of compliance to be certified for compliance by professional inspectors. Such certification could (partially) exempt them from certain regulatory responsibilities, such as monitoring activities, and indirectly shield them from third-party lawsuits by reducing the degree of their environmental liability. (Essential to the implementation of this type of program is regular training and (re-)certification of inspectors by the regulating agency to ensure quality assurance and quality control).

II. BACKGROUND

Storm water pollution has received steadily increasing attention from regulating agencies as well as environmental groups in the past decades. In California, efforts to better control industrial storm water pollution have resulted in legislation specifically aimed to improve the efficacy of the GISP program. Examples include Assembly Bill 2019, which mandates aggressive, mandatory enforcement actions to increase compliance with the NOI and annual reporting requirements, and Assembly Bill 1186, designed to substantially increase the funding available for the GISP program (AB 2019; AB 1186). Third-party lawsuits triggered by non-profit environmental organizations have contributed to raising the public's awareness of storm water pollution and of the importance of pollution prevention (P2).

There exist several known evaluations or reports, which have assessed the effectiveness of industrial storm water program, on both the regional and national levels. The Water Environment Federation, under a cooperative agreement with the EPA in 1994, conducted a nationwide assessment of the federal industrial storm water program implemented by USEPA (WEF 1996). The study presented the permittees' perceptions of how effective they thought the individual components of the federal industrial storm water program were in controlling and reducing storm water pollution. Two of the key findings from the study were that 1) of those companies regulated by the storm water permit program, 12.5% appeared to be out of compliance with the requirement to develop and maintain a SWPPP onsite; and that 2) small businesses spend less money on compliance and are more likely to be out of compliance because they lack environmental staff and a clear understanding of the requirements.

On a regional level, a 1998 report by Heal the Bay, a non-profit environmental organization with a primary focus on the protection of Santa Monica Bay in Southern California, criticized the lack of accomplishments of the industrial storm water program implemented by the Los Angeles Regional Water Quality Control Board (Los Angeles RWQCB), in areas of compliance assurance and enforcement activities conducted since the adoption of the GISP in 1991 (HTB 1998). In 1998 a Los Angeles RWQCB staff generated and submitted a draft report to the State Board titled, "Analysis of the Sampling Results: 1996-1997 Annual Report for Storm Water Industrial Activities General Permit". The draft document showed that a substantial fraction of the storm water data submitted for the 1992/93 and 1996/97 years exceeded the USEPA benchmark levels (RWQCB 1998). In February 2000, the National Resources Defense Council, a non-profit organization of attorneys working for environmental causes, submitted a formal written petition to EPA asking it to correct deficiencies or to withdraw from the State of California the delegated authority to implement its own storm water program, *specifically in the Los Angeles Region*. The petition documented the failure of the Los Angeles RWQCB to fully implement its storm water programs and cited the lack of sufficient funding and resources as the primary reason for the noted deficiencies (NRDC 2000). USEPA also cited similar findings in several of its annual audit summaries of the Los Angeles RWQCB's storm water programs and strongly recommended a significant augmentation in the available funding to provide the resources needed to fully implement the program (USEPA 1998; USEPA 2000a).

USEPA recognized that the RWQCB staff had achieved significant accomplishments given severely constrained resources (USEPA 1998).

Whereas many of the cited studies and analyses primarily focused on the deficiencies in the overall programmatic implementation at the RWQCB level, this study shifts the focus of its evaluation to the facility level where pollution control occurs. And by assessing the permittees' performances and compliance with the GISP requirements, this study attempts to shed light on the drawbacks and the barriers associated with the GISP program that must be addressed in order to improve the program's efficacy in controlling industrial storm water pollution. In addition, this study takes a hard look at whether the GISP requirements and its terms of compliance have been defined in such a way as to ensure adequate protection of water quality and beneficial uses of receiving waterbodies. Lastly, this study provides specific recommendations to remedy the deficiencies noted in its evaluation. To fully characterize the state of compliance achieved by the target industry, this study employed a multi-tiered assessment approach looking at the full spectrum of requirements, from initiation of coverage to field implementation.

AUTO DISMANTLING INDUSTRY

Auto dismantling industry was targeted for compliance assessment for the following reasons:

- Auto dismantling facilities, also known as auto salvage yards or auto recycling facilities, represent a significant portion (about 15%) of facilities covered in the Los Angeles RWQCB's GISP program;

- Many of the typical operational and material handling practices conducted at auto dismantling facilities are performed outside and thus are exposed to storm water. Typical activities include dismantling vehicles and automotive parts; draining automotive fluids; storing auto parts, auto bodies and waste fluids, washing and rinsing of parts, and shipping and receiving activities;

- Spills and leaks of waste fluids and waste oil, which are common occurrences at auto dismantling facilities, contribute conventional and toxic pollutants, in particular, heavy metals and certain hydrocarbons, to storm water runoff (Swamikannu 1994); and

- The auto dismantling industry is difficult to regulate because the majority of businesses are small, mom-and-pop facilities that tend to change ownership rather quickly, posing a special challenge in outreach and compliance assurance activities for the regulating agency (approximately 70% of all auto dismantling facilities in Los Angeles County covered under the GISP are 1 acre or smaller). Economic and personnel constraints impact the ability of smaller facilities to fully comply with the GISP requirements.

MULTI-TIERED ANALYSIS

Tier 1
File a Notice of Intent (NOI)

Tier 2
Prepare SWPPP and written Monitoring Program
Submit Annual Monitoring Report by July 1st

Tier 3
Implement Best Management Practices (BMPs)
Conduct required monitoring activities

For purposes of evaluation, compliance was divided into three tiers:

Tier 1 (Initiation)
Facilities classified under certain standard industrial classification (SIC) codes specified in the GISP for coverage (including the auto dismantling industry whose SIC code is 5015) must file a NOI to apply for permit coverage. Facilities that are required but fail to file a NOI are referred to as 'non-filers'.

Tier 2 (Reporting/Documentation)

After submitting a NOI, facilities must submit an Annual Monitoring Report by July 1st of each year that summarizes both the qualitative and quantitative results from their monitoring activities. In addition to the annual reporting requirement, facilities must prepare appropriate storm water documents known as a Storm Water Pollution Prevention Plan (SWPPP) and a written Monitoring Program (MP) necessary to guide them in their P2 efforts. The purpose of a SWPPP is to serve as a "blueprint" for achieving compliance by specifying specific BMPs and a schedule of BMP implementation. Written monitoring programs must contain adequate procedural details to ensure that proper monitoring of facility condition and its storm water is provided.

Tier 3 (Implementation):

Facilities must implement BMPs provided in their SWPPP and conduct monitoring activities required by the GISP. BMPs include both non-structural and structural controls that can reduce the level of pollutants in storm water. Monitoring requirements may be broadly grouped into visual observations, storm water sampling and analysis, site inspection, and SWPPP review and update. Storm water sampling and analysis, along with the other monitoring activities, help evaluate the quality of the storm water runoff generated from the facilities and gauge the effectiveness of the facility's efforts to control storm water pollution.

The state of compliance achieved by the permittees is a reflection of how diligently facilities have been implementing the GISP requirements. Knowledge of the current state of compliance achieved and an estimate of associated load can serve many useful purposes. For example, such an understanding could help gauge if an existing program, such as the GISP, has the potential to attain further pollutant load reduction if required, for example, as part of the implementation of a Total Maximum Daily Load (TMDL). TMDL is the "amount of a specific pollutant that a waterbody can receive and still maintain water quality standard" (TWA 2000). If the majority of dischargers permitted under a given regulatory program are shown to be at the high end of a compliance curve, this implies that the program has nearly reached its maximum attainable pollutant reduction. Under such a scenario, opportunities for significant additional reduction in load would be slim. Conversely, if most dischargers are found to be at the bottom of a compliance curve, then there may be opportunities for substantial pollution reduction to be achieved through increased compliance activities.

If the GISP requirements are implemented to their maximum at the facility level, and facilities are still unable to attain the assigned load, then perhaps the standard of compliance defined in the GISP or the existing approach used to implement the GISP program may need to be re-evaluated. California has yet to allocate load associated with industrial storm water pollution. Nevertheless, an understanding of the current state of compliance under the GISP program and getting a good sense of the magnitude of load generated by industrial sectors will no doubt be useful for making critical management decisions. Also, this type of assessment will help to identify priority or high-risk industrial sectors - e.g. those with low compliance and high load contribution - to direct limited resources to the most critical areas.

LACK OF NUMERICAL EFFLUENT LIMITATIONS IN GISP

Standards for compliance can be expressed in various ways. NPDES permits may contain both qualitative and quantitative effluent limitations with which permittees must comply. Numerical effluent limitations may consist of technology- and water quality-based limits. The GISP, which falls under the NPDES framework, does not contain numerical effluent limitations for the majority of dischargers permitted under the program (Facilities among the ten industrial categories listed in USEPA regulations (40 CFR Subchapter N) must comply with the technology-based limits established by USEPA for specific pollutants. These Subchapter N facilities represent only a small portion of the facilities under the RWQCB's GISP program.)

In the absence of numerical effluent limitations, BMPs form the pillar of the GISP program. This is consistent with the "Interim Permitting Approach for Water Quality-based Effluent Limitations in Storm Water Permits" (USEPA 1996). The interim permitting approach uses BMPs in first-round storm water permits, and expanded or better-tailored BMPs in subsequent permits, where necessary, to provide for the attainment of water quality standards. While it is recognized that numeric water quality-based effluent limitations could potentially provide a greater degree of confidence that a discharger will not cause or contribute to an exceedance of the water quality standards, the variable nature of storm water discharges and the lack of information on which to base numeric water quality-based effluent limitations are the main reasons that EPA developed the interim permitting approach.

There are several standards or conditions specified in the GISP that dischargers must attain including the Best Available Technology Economically Achievable (BAT) and Best Conventional Pollutant Control Technology (BCT) levels. In addition, one of the prohibitions in the GISP states that storm water discharge shall not cause or contribute to a violation of applicable water quality standards. Specifically, the achievement of BAT and BCT levels must be demonstrated by fulfilling the requirements of the GISP, which states "compliance with the terms and conditions of this General Permit constitutes compliance with BAT/BCT requirements and with requirements to achieve water quality standards." However, as discussed in the preceding section, determining compliance based on BMP implementation and performance is complicated by the absence of clear, uniform standards for measuring compliance, and because each assessment requires site-specific considerations. Prerequisites for successful attainment or measurement of progress toward desired goals are clear and adequate definitions of expectations or goals to be achieved. The lack of quantitative or numerical targets in the GISP inevitably generates questions and confusion as to whether a facility has indeed successfully achieved compliance. And herein lies one of the major handicaps of the GISP program.

A comparison of analytical monitoring data between facilities could shed light on the relative overall effectiveness of BMPs implemented at different sites. However, the bottom-line question is "how effective is effective?" Therefore, quantitative standards of some sort must be provided in order to determine the adequacy of storm water measures provided by facilities. One set of standards that has been used by RWQCBs in California and USEPA for its national storm water program is the USEPA benchmark values provided in the Final National Pollutant Discharge Elimination System Storm Water Multi-sector General Permit for Industrial Activities (hereafter USEPA Multi-sector Permit; USEPA 1995, USEPA 2000b). The benchmarks are indicators of potential impact of discharge but are not enforceable as numerical effluent criteria through the GISP program. These benchmark values are based on several sources of information, including fresh water criteria based on the effects on aquatic species, median concentrations from the National Urban Runoff Program, and minimum levels based on detection limit. However, for these numeric water quality standards to become enforceable through the NPDES framework, they must be translated into appropriate (numeric) *effluent limitations* that typically must be met "end-of-pipe". The Discussions section, under "Case study investigations: storm water analysis," explores the situation in greater depth and recommends some specific means to address this issue of whether compliance can be adequately defined to protect water quality in the absence of numeric effluent limitations.

III. METHODS

This study used database analysis, document review, and case study evaluations consisting of site inspections and storm water sampling and analysis to assess compliance of the selected auto dismantling facilities with the requirements of the GISP program. A mathematical equation, known as the EPA Simple Method, was used to quantify pollutant load in storm water runoff from the auto dismantling industry.

NON-FILER IDENTIFICATION (TIER 1 ANALYSIS)

To assess the non-filer situation, this study used two sources of data as presented in Table 1. First, to perform a county-wide evaluation, staff enlisted the cooperation of the California Department of Motor Vehicles, Occupational License Division (DMV) to obtain a list of auto dismantlers in Los Angeles County who had applied for and maintain a current dismantling license (DMV 1999). Each facility name and address on the DMV list was queried and checked using the RWQCB's NOI database to determine if the facility had filed a NOI. Facilities on the DMV list missing from the NOI database were contacted by phone to verify their operating status and the accuracy of the facility-specific information.

The second analysis focused on a four square-mile area within the County known to have high population of auto dismantling facilities. The data used in this study has been compiled by the City of Los Angeles inspectors who conducted door-to-door site visits between December 1998 and May 2000, specifically to identify non-filers in areas within the City of Los Angeles. The site visits were conducted as a Supplemental Environmental Project (SEP) that the City undertook, as part of its penalty under an Administrative Civil Liability issued by the RWQCB for City's past sewage spill incidents. A group of University of California at Los Angeles (UCLA) professor and students led the efforts to provide data QA/QC and data analysis.

TABLE 1. Data Source and Analytical Procedures for Non-filer Assessment

	Analysis I	**Analysis II**
Type	Auto Dismantling License Information	Door-to-door Site-visits
Source	California DMV Occupational License Division	RWQCB (City of Los Angeles' Supplemental Environmental Project)
Target area	Los Angeles County	City of Los Angeles (four square-mile area)
Analytical Procedures	1. Cross-check information on DMV list with NOI database 2. Perform over-the-phone verification of operating status and other information 3. Compile and analyze data	1. Query site visit results for auto dismantling facilities (conducted by UCLA) 2. Confirm NOI status (City of LA/ UCLA) 3. Analyze results by area (UCLA)

DETAILED STORM WATER DOCUMENT REVIEW (TIER 2 ANALYSIS)

The next level of evaluation focused on the facilities' compliance with the reporting and documentation requirement. To obtain a smaller pool of facilities for an in-depth review of storm water documents, this study selected 52 facilities from a total of 349 auto dismantling facilities from the NOI database. To ensure a representative pool, the facilities were chosen by first alphabetically sorting the 349 facilities by business name and choosing every sixth facility (A small number of the chosen facilities were located in Ventura County. These facilities were eliminated to limit the focus to Los Angeles County.)

To evaluate permittee compliance with the annual reporting requirement, this study chose to concentrate on trends observed in Annual Report submittal rates over times, based on the 52 selected auto dismantling facilities and on the quality of the Annual Reports submitted for the 1997/98 permit year. The proportion of facilities submitting the Annual Reports, among the 52 selected facilities, was determined by electronically querying the Annual Report databases maintained at the RWQCB. Similarly, the 1997/98 Annual Report database was queried for summaries of monitoring activities conducted by facilities. In addition, Annual Reports were reviewed for more detailed information not electronically available.

SWPPPs and written Monitoring Programs were requested from the selected 52 facilities through a formal letter issued by the RWQCB to each facility operator. An in-depth review of the SWPPPs and the written Monitoring Programs was provided using a checklist (see Appendix A) outlining the requirements specified in Sections A and B of the GISP.

CASE STUDY INVESTIGATIONS (TIER 3 ANALYSIS)

To investigate the onsite component of compliance, this study selected nine out of the 52 facilities for site-specific evaluation. These nine facilities were clustered in the San Gabriel River and Los Angeles River watersheds. Staff inspected all nine sites and collected storm water samples from the eight sites that produced sufficient volume of runoff to enable sample collection. Storm water samples were collected from primary discharge locations that conveyed runoff from the areas where principal industrial activities were conducted. The purpose was to assess the extent to which facilities implemented the BMPs indicated in their SWPPPs and to study the overall effect of the BMPs implemented based on the storm water analytical data. Storm water sampling activity and analysis were carried out under conditions consistent with the requirements in the GISP. Only fully-trained staff and interns participated in the storm water sample collection, handling, storage, and transport activities to ensure adequate QA/QC. Chain of custody forms were completed for all samples. Samples were analyzed by the California Department of Health Services laboratory.

WATER QUALITY IMPACT ASSESSMENT

EPA Simple Method

To provide a perspective on the potential water quality impact(s) associated with storm water runoff generated from the auto dismantling industry, pollutant load was estimated using storm water analytical data from the case study investigations. This study used the EPA Simple Method equation for load assessment:

$$L = 0.227*P*P_j*A*C(0.05 + 0.009*I)$$

where

L = pollutant load (pounds/ per year);

C = average flow-weighted concentration of the pollutant in runoff (mg/L or ppm);

P_j = fraction of rainfall events that produce runoff;

P = annual precipitation in inches per year (inches per year);

A = area of the site (acres);

I = the percent of the site's imperviousness; and,

0.227 = conversion factor (inches/foot)* (acre-feet-ppm/pounds).

IV. DISCUSSION OF RESULTS

This chapter presents key findings on the degree of compliance achieved by auto dismantling facilities; evaluates the quality of storm water runoff generated from selected facilities; estimates the load contributed by the industry in the form of storm water pollution; and discusses water quality implications associated with the key findings of this study.

NON-FILERS

Applying for coverage under the GISP does not guarantee that a facility will actually achieve pollution abatement, but it is an important first step. Also, from the perspective of "leveling the playing field," it is necessary for regulators to characterize the extent of non-compliance with the NOI requirement and take aggressive, timely actions once non-filers are identified to bring them into compliance. Auto dismantling facilities, due to the nature of the industrial activities conducted onsite, are subject to the GISP requirements. Facilities of this industry are informed about the GISP requirements through two main channels. First, auto dismantling facilities are notified about the NOI requirement by the California DMV when they apply for a dismantling license from the DMV's Occupational License Division. The DMV auto dismantling license application includes a questionnaire about whether the facility operator has filed a NOI with the State Board. (The DMV forwards a copy of the completed application to the State Board per pre-established interagency agreement/cooperation between the two state agencies.) The second channel of information regarding the industry's duty to comply is the mass-mailing that the State Board periodically conducts as part of its effort to reach potential non-filers.

Table 2 describes the results of non-filer identification using the DMV dismantling license list. Of the 463 facilities on the list that were checked against the RWQCB's NOI database, 147 were identified as potential non-filers. Phone verification identified 77 of the 147 facilities to be actually operating without a NOI. In other words, approximately one-fifth of the facilities on the DMV list comprised of non-filers. The rest of the 147 facilities had either terminated operation or could not be reached after multiple phone attempts.

Essential to obtaining an accurate estimate of non-filers is an understanding of the total universe of facilities regulated. In screening the DMV list against the NOI database for non-filers, this study assumed that the DMV list represented a relatively thorough estimate of the total universe of auto dismantlers in Los Angeles County. To test this assumption, staff screened to see whether the auto dismantlers in the NOI database appeared on the DMV list. This screening effort yielded 72 facilities that could potentially be operating without a dismantling license. Phone verifications confirmed 35 of these to be in operation. This effort yielded a conservative estimate of 404 for the total universe of auto dismantling facilities operating in Los Angeles County, as of August 1999, when this analysis was conducted. This estimate includes facilities operating with either or both a NOI or a dismantling license. The number of facilities operating with neither a NOI nor a dismantling license is unknown and is needed to

TABLE 2. Non-filers Among Auto Dismantling Facilities, Los Angeles County: DMV Licenses vs. NOIs Filed[1]

	NOI STATUS[2]					
				No NOI[5] (Potential Non-filers = 147)		
DMV COVERAGE[3]	Active NOI[4]	Suspended NOI	Terminated NOI	Verified **Non-filers**	Out of Operation	Unverifiable
DMV Licensed	292	1	23	**77**	25	45 (21) [6]
No DMV License (72)						
Verified Non-licensed[3]	**35**	-[7]	-	Unknown	-	-
Out of Operation	34	-	-	-	-	-
Unverifiable	3	-	-	-	-	-

The proportion of non-filers among auto dismantling facilities operating in Los Angeles County is estimated at 19% (77 out of 404). The total universe of auto dismantlers in Los Angeles County exceeds 400, based on the number of active NOIs and verified non-filers. For a more accurate characterization, those operating with neither a NOI nor a DMV license need to be accounted for in the total universe of facilities.

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[1] Table 2 originally appeared in a doctoral dissertation (*Chang 2001*).
[2] A RWQCB's NOI database contains information on facilities with NOIs.
[3] In California, auto dismantlers are required to obtain a dismantling license from the Department of Motor Vehicles (DMV), Occupational Licensing Department prior to operation. The list of facilities in Los Angeles County with auto dismantling license was obtained from the California DMV in August 1999.
[4] Note that the total number of auto dismantlers in the NOI database with active status is 364, slightly higher than the total number (349) that was used to select the study pool of 52 facilities. The pool of facilities with active NOIs changes over time as facilities begin and terminate coverage.
[5] Facilities that did not appear on both the DMV list and the NOI database were contacted by phone to confirm their operating status. The facilities were categorized as: "verified" non-licensed (DMV); non-filers; out of operation; and unverifiable if they could not be reached by phone after numerous attempts.
[6] Of the 45 facilities in the unverifiable category, 21 did not have phone numbers listed on the DMV list nor with directory assistance. Therefore, the operating status of these facilities could not be verified. The rest did have phone numbers listed but could not be reached.
[7] Dashes mean not applicable.

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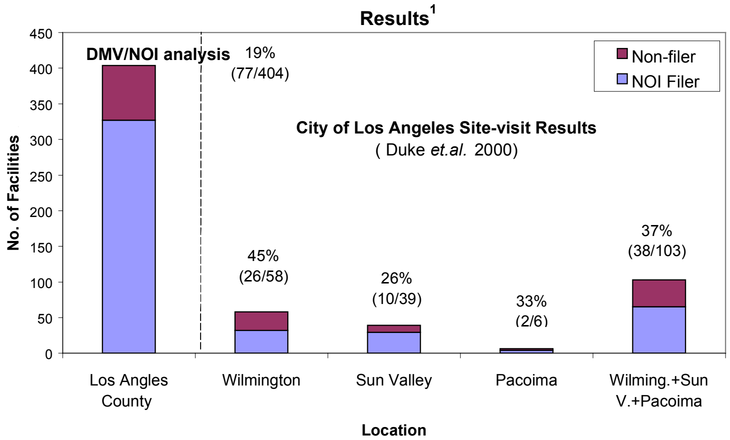
accurately characterize the total universe of facilities, is not known at this time. This estimate lies outside the realm of the objectives and methodology of this study. However, considering the potential severe consequences of violations under both regulatory requirements, the actual number of facilities in this category is probably a small percentage of the total number of auto dismantling facilities in operation.

This study further investigated the 10% (35 of the 364) of auto dismantling facilities with an active NOI that were verified to be operating without a dismantling license. The purpose was to shed some light on reasons that some facilities have apparently chosen to comply with one type of regulatory requirement over another. Each of these facilities were contacted by phone for explanations as to why the facility appeared to be in violation with a regulatory requirement so essential to its operational activities (a valid dismantling license is required for transactions at used auto auctions). It turned out that a small fraction of these facilities (less than 10% of those contacted) actually had a dismantling license, either under a slightly different address or business name, or under the name of the facility's headquarters. Facilities that knew they were in compliance cooperatively shared their dismantling license information with the

RWQCB staff. The remaining facilities, however, refrained from revealing their dismantling license number or from discussing possible reasons why the facility is not represented in the DMV dismantling license database, even after repeated assurances from staff that the information was for research purposes only and not for enforcement activities. It is highly likely that these facilities were operating without a valid dismantling license.

Figure 1 illustrates the outcome of the two non-filer analyses, showing the percentages of non-filers for the overall County and at the sub-city level. Presented to the left of the dotted line is DMV/NOI analysis, and to the right are the site visit results. The site visits performed by the City inspectors targeted three areas within the City of Los Angeles boundary-- Wilmington, Sun Valley, and Pacoima-- with the first two areas accounting for over 40% of all auto dismantlers in Los Angeles County with an active NOI. A total of six auto dismantling facilities were identified and visited in Pacoima. Overall, non-filers accounted for 37% of the auto dismantling facilities identified in the three areas. The area with the highest ratio of non-filers was Wilmington (45%), followed by Pacoima (33%) and Sun Valley (26%). Only six auto dismantling facilities were identified in Pacoima.

Figure 1. Non-filers Among Auto Dismantling Facilities in Los Angeles County, CA.: Identified from Database Analysis and Site-visit Results[1]



[1] Figure 1 originally appeared in Chang 2001.

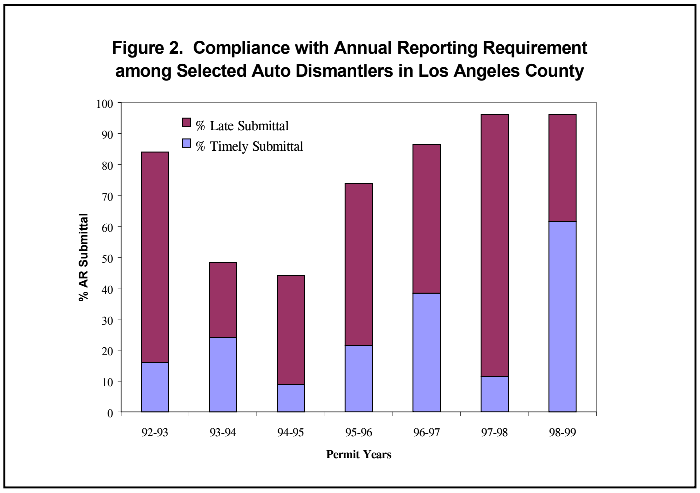
Because the site visits did not cover all of Los Angeles County, the results obtained from the site visits cannot be directly compared with the findings from the DMV license analysis. The site visit results, though, indicate that the proportion of non-filers among auto dismantling facilities in some areas of Los Angeles County could be twice as high as the average estimated by the DMV/NOI analysis for the entire County. Three reasons potentially account for the substantial difference between the ratio of non-filers estimated for the County and at the sub-County levels. First, Wilmington and Pacoima may have disproportionately high percentages of non-filers compared to the rest of Los Angeles County (Sun Valley had a similar percentage of non-filers as estimated by the DMV/NOI analysis). Second, the number of facilities delinquent with both the NOI and the dismantling license requirements could be significant. These facilities may be reflected in the site visit results but not in the DMV database. Another possible explanation is that the areas visited by the inspectors had both disproportionately high percentages of non-filers and non-DMV-licensed facilities. (Note: The RWQCB has started to follow up with facilities, across all industries, which were identified as potential non-filers by the City inspectors. Out of about 430 facilities fully inspected, approximately 200 facilities were identified as potential non-filers and are subject to follow-up activities, including a letter notifying their potential to file a NOI and an inspection, if necessary.)

As demonstrated by the statistics, the non-filer problem is significant for the auto dismantling industry. However, to place the non-filer situation in the context of other industries, this study also looked at the City's site visit results for two other major industries mandated for coverage under the GISP- recycling and transportation sectors. Of the three sectors, the auto dismantling industry had the highest compliance rate with the NOI requirement of 63%, followed by transportation with 38%, and recycling with 13% (Duke et al 2000). The higher compliance by the auto dismantling industry could be attributed to the successful interagency coordination between the State Board and the DMV. As a way to effectively identify and reach out to potential non-filers, this study recommends that the State Board actively solicit the cooperation of other state/local agencies to enhance information sharing and to incorporate the NOI requirement by reference into other regulatory requirements, similar to the DMV dismantling application procedures. Auto dismantling licenses and construction grading permits (under the Municipal storm water requirements) are two examples where filing a storm water NOI has become a pre-requisite for license/permit issuance.

In conclusion, full compliance with the NOI requirement has not been attained by the auto dismantling industry. The DMV dismantling license analysis, which probably underestimates the number of non-filers for reasons explained revealed that, at minimum, one out of every five auto dismantling facilities in Los Angeles County is a non-filer. In some areas of Los Angeles County, such as Wilmington, the non-filer problem appears exacerbated, with approximately one out of every two facilities operating without a NOI. The recommended approach for identifying non-filers is to utilize interagency coordination and employ available databases, such as the DMV dismantling license and NOI information supplemented by site visits. Agency-generated data probably offers a higher degree of accuracy than commercially available databases. At this time, it is difficult to draw any quantifiable conclusions about the water quality implications associated with "non-filer" sites, including whether the quality of runoff from non-filers, on average, is expected to differ significantly from runoff from permitted facilities. because there are no known studies or data that specifically target the quality of storm water runoff from non-filer sites.

ANNUAL REPORTS

This sub-section describes the trend in compliance achieved by the 52 selected auto dismantling facilities with the requirement to submit Annual Reports by July 1st of each year. Also characterized are the facilities' performances in implementing the required monitoring activities for the 97-98 permit year. Both qualitative and quantitative monitoring data serve as an indicator of each facility's overall performance with BMP implementation, help build a comprehensive inventory of essential water quality data, assist in developing water quality standards, and more. For instance, analytical monitoring data provided in the Annual Reports present a potential source of information necessary to support the quantification of loads associated with storm water runoff from industrial sources, a step necessary to develop TMDLs. The types of monitoring summaries contained in the Annual Reports, if completed properly by facility operators, could reveal important facility-specific and compliance-related information such as how diligently a facility implemented the required monitoring activities, the quality of the storm water runoff generated from the facility, and whether the facility operator has reviewed and updated the facility's SWPPP, and reassessed the adequacy of existing BMPs in controlling storm water pollution.



[1] Figure 2 originally appeared in Chang 2001.

Figure 2 illustrates the trend in facilities' submittal of Annual Reports from 1992 to 1999. The overall height of a bar indicates the total percentage of Annual Reports submitted for a given permit year. The lower, lighter portion of bar indicates the proportion of facilities that submitted Annual Reports on or before July 1st. The upper, darker portion represents late submittals. Compliance is represented in percentages rather than actual number of reports submitted because the number of facilities *required* to submit Annual Reports varied over time because the facilities' coverage under the GISP program was initiated at different times (by 1996, all of the 52 selected facilities had filed a NOI).

As illustrated in Figure 2, compliance was low in the early years, with the majority of the facilities failing to submit the required Annual Reports for the 1993/94 and 1994/95 permit years, and with the majority of the reports arriving late. The lack of sound monitoring data, as a result of deficient reporting, would leave both the regulators and the dischargers in the dark about critical questions such as how successful an individual or a group of facilities' efforts have been in controlling storm water pollution at their site and their progress over the years. In addition, not having adequate analytical data substantially limits regulatory efforts to characterize the quantity of load associated with the storm water runoff from regulated communities. Without the data necessary to self-diagnose their facility's performance and a chance to address the deficiencies in a timely manner, facility operators are really placing themselves in jeopardy of increasing their environmental liability and the chances of regulatory enforcement actions and third-party lawsuits. Therefore, both the dischargers and the regulators are negatively impacted when facilities fail to monitor and report their monitoring results to the appropriate regulating agency.

Observations based on the 52 selected auto dismantling facilities revealed that starting in 1995/96, two-thirds or more of the required facilities submitted their Annual Reports. The highest Annual Report submittal rate (96%) achieved in 1997/98 and 1998/99 is an outcome of increased enforcement activities launched by the RWQCB in recent years and demonstrate the importance of and the need for aggressive, timely regulatory follow-up activities.

Several hundred enforcement letters were issued in 1997/98 to facilities across all industrial sectors that failed to submit Annual Reports on time. As apparent from Figure 2, the majority of the 1997/98 Annual Reports were received late, with most of them probably in response to the enforcement letters. The subsequent permit year had even greater success. While maintaining the Annual Report submittal rate at 96%, there was a substantial increase in the number of reports being submitted on time.

Evidently, the large-scale enforcement activities, including the issuance of formal violation letters and mandatory penalties for recalcitrant violators, have resulted in tangible results and have demonstrated to be an effective tool for communicating to the regulated community the potential severe consequences of violating storm water regulations.

The usefulness of the Annual Reports to regulators and dischargers alike depends on the accuracy and the completeness of the reports being submitted. In the Los Angeles Region, much of the agency's limited resources have been dedicated in the past to identifying and following up with facilities that have failed to submit Annual Reports. Constrained by resources, limited regulatory attention was focused on the quality of the Annual Reports received or the monitoring results reported in the Annual Reports. This study conducted detailed reviews of the 1997/98 Annual Reports submitted by 50 of the 52 selected facilities to contribute to an increased understanding of the quality of Annual Reports and the monitoring data submitted by auto dismantling facilities.

Figure 3. Storm Water Monitoring Activities Conducted by 52 Selected Auto Dismantling Facilities (1997/98 Annual Reports)

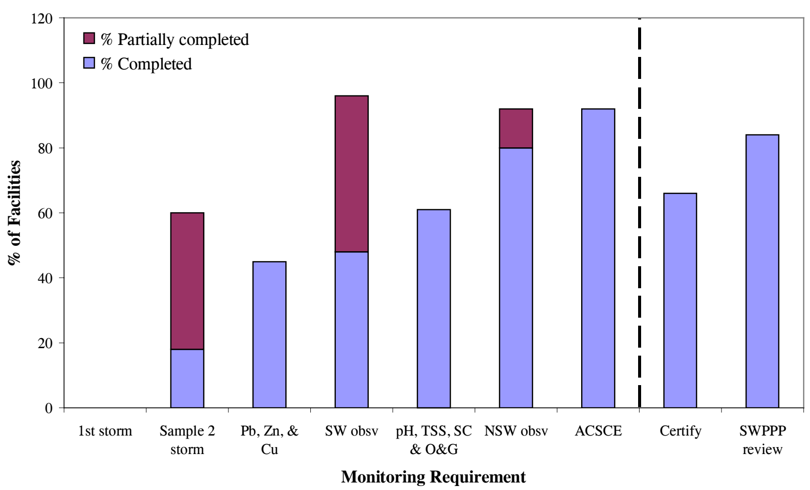


Figure 3 illustrates how successfully the 50 facilities that had submitted the Annual Reports fulfilled their required monitoring activities (two of the 52 facilities did not submit their Annual Reports). Results are presented in the order of low to high compliance, in terms of facilities that fully satisfied a monitoring requirement, as indicated by the bottom, lighter portion of a bar. The upper, darker portion represents facilities that partially completed a required monitoring activity. Bars to the left of the dashed line indicate monitoring activities and to the right are administrative requirements associated with the monitoring program. Monitoring requirements include: visual observations of storm water and non-storm water runoff, storm water sampling and analysis, and an annual comprehensive site evaluation that includes a full-scale site inspection and a SWPPP review and update. Table 3 augments the findings on the monitoring activities with detailed narrative description.

None of the individual categories of monitoring activities were completed by all 50 selected facilities. Overall, facilities were less likely to perform monitoring activities that are more cost- and effort-intensive, such as storm water sampling and analysis, than activities that are simple to perform and involve little or no cost, such as visual observations. This trend was observed even among activities such as visual observations that require minimal resources to perform. Approximately 80% of the facilities fully complied with the quarterly observation of non-storm water (a total of four observations required to be conducted under *dry* weather conditions). A

Table 3. Summary of Monitoring Activities Reported by for 50 Selected Auto Dismantling Facilities (1997/98 Annual Reports)

MONITORING REQUIREMENT	FACILITY COMPLIANCE						COMMENTS
	Completed		Partially Completed		Did Not Attempt		
1. Submit Annual Report by July 1st deadline	31	62%	19	38%	N/A	N/A	• "Completed" means facility submitted the Annual Report before or on 7/1/98. • "Partially Completed" means facility submitted Annual Report after 7/1/98. • "Did Not Attempt" means facility did not submit Annual Report.
2. Sample from two storm events	7	18%	16	42%	15	40%	• "Completed" means facility collected and analyzed sample(s) from two qualifying storm events. • "Partially Completed" means facility collected and analyzed sample(s) from one storm events. • "Did Not Attempt" means facility did not collect or analyze any sample. • Twelve out of the 50 facilities belonged to a Group Monitoring Program and were exempt from sampling during the 97-98 year. Therefore, statistics for Requirements #2-#4 reflect results for 38 facilities. • Most facilities that failed to collect samples from two storm events did not have adequate explanations. The 97-98 wet year is marked by unusually plentiful rainfall due to the El Niño phenomena.
3. Sample from the first storm	0	0%	N/A	N/A	38	100%	• The first flush occurred on a weekend. GISP does not mandate facility operators to collect storm water samples outside of their typical operating hours or under hazardous conditions. • 19 out of the 38 facilities provided inadequate reasons for not sampling from first storm; four out of the 38 facilities that failed to sample from first storm did not provide any explanation.
4. Analyze samples for pH, TSS, SC, and O&G	23	61%	0	0%	15	39%	• About 39% of the facilities failed to collect any samples • All 23 who sampled from at least one storm tested for these basic constituents.
5. Analyze samples for Cu, Pb, and Zn	17	45%	N/A	N/A	21	55%	• Seventeen facilities tested at least one set of samples for Pb, Cu, and Zn. • About 55% of the facilities either failed to sample at all or sampled from at least one storm but failed to analyze for metal.

Table 3. Summary of Monitoring Activities Reported by for 50 Selected Auto Dismantling Facilities in 1997/98 Annual Reports

(Continued)

MONITORING REQUIREMENT	FACILITY COMPLIANCE						COMMENTS
	Completed		Partially Completed		Did Not Attempt		
6. Conduct quarterly non-storm water visual observations	40	80%	6	12%	4	8%	• "Completed" means facility conducted four quarterly observations. • "Partially Completed" means facility conducted at least one but less than four quarterly observations. • Two facilities attached a narrative description of the type of authorized non-storm water discharges observed from their site. However, when asked in the Annual Report whether the facility ever had authorized non-storm water discharges, both facility operators answered negative.
7. Conduct monthly storm water visual observations during the wet season (Oct. 1st – May 30th)	24	48%	24	48%	2	4%	• "Completed" means facility conducted eight monthly observations during the wet season (October to May). • "Partially Completed" means facility conducted at least one but less than eight monthly observations during the wet season. • If a month had no storm, the facility operator must report so.
8. Conduct annual site evaluation	46	92%	N/A	N/A	4	8%	• Four facilities that failed to conduct Annual Comprehensive Site Compliance Evaluation (ACSCE) provided no explanation.
9. Review SWPPP for BMPs and compliance	42	84%	N/A	N/A	8	16%	• Eight facilities that failed to review SWPPP provided no explanation.
10. Certify for compliance	33	66%	N/A	N/A	17	34%	• Of the 17 facilities that did not certify for compliance, 16 facilities cited their failure to meet one or more of the monitoring requirements as the reason for not certifying. • One facility did not provide any explanation for not certifying for compliance.

substantially smaller proportion of facilities (less than half) completed the storm water runoff observations (a total of eight monthly observations activities during *rain* event).

None of the facilities were able to collect samples from the first storm event because the first storm event of the 1997/98 wet season occurred on a Sunday for most of the Los Angeles region (Facilities are not required to sample outside of their normal business hours or under dangerous conditions). Some facilities did not provide a valid explanation for their failure to sample from the first storm event. Less than 20% of those *required* actually sampled from two storms events, as required by the GISP (note: Some facilities that belong to a group monitoring program are subject to less frequent sampling. This study appropriately accounted for those facilities in its analysis). The 1997/98 wet season was impacted by El Niño and had unusually frequent and intense storm events, therefore ruling out the lack of sufficient rain as one of the valid excuses for not sampling. Less than half of those required actually analyzed for copper, lead, and zinc. And among the facilities that sampled from at least one storm, about a quarter did not analyze for the required metals. Failure of facilities to analyze for the designated constituents --i.e. specific pollutants determined by regulators to be of concern for a particular industry -- really hinders efforts to quantitatively evaluate a facility's performance and to gauge potential water quality impact.

Inherent to self-reported information without QA/QC procedures is the uncertainty in the accuracy of the data provided. Annual Reports are subject to similar deficiencies. Each Annual Report must contain a self-certification of compliance signed by the facility operator or equivalent. Whether self-certifications are a reliable gauge for measuring facility compliance depends on several factors including a facility operators' level of understanding and informed interpretation of the GISP requirements and their ability to appropriately assess and accurately report the facility's compliance status. To evaluate how accurately the Annual Reports reflect facility compliance, this study compared the number of Annual Reports self-certified for compliance against the number of facilities reported to have successfully complied with a particular category of monitoring requirement. We considered a monitoring activity that is required of *all* facilities- monthly visual observation of storm water discharges. According to Table 4, less than half, 48%, completed all eight monthly visual observations of storm water, which implies that an equal or smaller number should have certified for compliance, considering the fact that a facility must also satisfy all the other GISP requirements before certifying for compliance. About two-thirds of the Annual Reports were self-certified, pointing to a discrepancy of at least about 20% between those certifying for compliance and those actually complying. It should be noted that only one monitoring activity was considered here. In reality, the actual gap between the number that self-certified and the number that fully completed all required monitoring activities or all GISP requirements is expected to be considerably larger.

Whether this discrepancy is due to a flawed interpretation of compliance criteria, mere carelessness on the part of the facility operator, or unwillingness to openly expose or admit one's deficiency for fear of potential enforcement, one conclusion that can be drawn is that self-certification is not a perfect indicator of facility compliance and should be used with caution when used to estimate permittee compliance.

STORM WATER POLLUTION PREVENTION PLAN

A hallmark of the P2 approach, which drives the GISP program, is the reliance on the facility operators to identify potential pollutant sources and appropriate site-specific BMPs to achieve P2 at their facility. The underlying assumption is that facility operators are the ones most familiar with the facility operations and other site-specific conditions. Therefore, facility operators are considered the ideal candidates for identifying site-specific solutions for their facility.

The GISP requires each facility operator to develop a SWPPP, which is a site-specific document that lays out exactly how a facility will control storm water pollution associated with its industrial activities. Compliance with the SWPPP requirement has not been well characterized because, unlike Annual Reports, SWPPPs are not required to be submitted to the RWQCB. An in-depth review of SWPPPs that considers the site-specific nature of each facility requires a substantial amount of time. This study is one of the first attempts in California and perhaps in the nation to characterize, on a large scale, the quality of the SWPPPs prepared by and for a specific industrial sector. A detailed review was provided for the 50 SWPPPs received based on specific SWPPP-related requirements outlined in Section A of the GISP. A summary of the deficiencies found in the SWPPPs are described in Table 4.

One major deficiency noted in many of the SWPPPs was that they were boiler-plate documents that lacked specific details on the actual BMPs chosen for implementation by the facility operator. Also missing were procedural details about how the BMPs would be implemented. About 90% of the SWPPPs reviewed were prepared by one of four consulting companies. Many of the SWPPPs were written in a vague manner that made it difficult to determine exactly which measure, among a set of "ideal" or "proposed" BMPs described in the document, was chosen for implementation by the facility operator.

As indicated in italics in Table 4, these SWPPPs provided no or limited information on: 1) the name(s) of individual(s) responsible for the implementation of various monitoring activities; 2) a detailed, comprehensive site map that describes the locations of pollutant sources and where industrial activities are conducted; and 3) BMPs that are fundamental to the P2 efforts, such as employee training, site inspection, and good housekeeping programs. In essence, a SWPPP is a "blue-print" that describes specific measures and a schedule of implementation a facility will employ to achieve P2 and regulatory compliance. The SWPPP should be a "living" document that is regularly updated and reflects the actual site conditions. Given their generally poor quality, the majority of the SWPPPs reviewed fail to effectively guide facility operators in the field implementation phase. From verbal communication with facility operators, it appeared that many SWPPPs were being developed by a third party with little involvement or input from the facility operators or key personnel. About a quarter of the 52 facility operators who had called after receiving the RWQCB's formal request for SWPPPs demonstrated little or no knowledge of the SWPPP requirement, indicating

Table 4. Review of SWPPPs and Written Monitoring Programs Submitted by about[1] 50 Selected Auto Dismantling Facility Operators (Los Angeles County, 1999)

Element Specified in General Permit	Missing	Inadequate Description
A. Storm Water Pollution Prevention Plan		
Pollution Prevention Team	0	31
Site map	2	35
List of significant materials handled or stored on site (describe type, location, and quantity)	5	26
Description of industrial activities and potential pollutant sources	2	16
Assessment of potential pollutant sources, pollutants and locations.	2	9
Spill history	5	0
Investigation of Non-storm water discharges	12	2
Non-structural Best Management Practices	0	18
Good housekeeping program	13	3
Preventive maintenance program	8	6
Spill prevention and response program	8	6
Material handling and storage procedures	8	3
Waste handling & recycling	9	5
Erosion and sediment control	9	1
Employee training program	9	10
Site inspection program	6	3
Recordkeeping and internal reporting	6	6
Quality assurance	5	0
Structural BMPs	2	N/A[2]
Annual Comprehensive Site Compliance Evaluation	2	18
B. Storm Water Monitoring Program		
Quarterly non-storm water visual observations	3	5
Storm water visual observations (monthly from October and May)	0	27
Field sampling procedures	0	12
Sampling program specifying locations and times	0	5
Sample preservation procedures	0	34
Analysis methods	7	11
Specification of constituents mandated for sample analysis	0	37
Retention of all records for at least 5 years	0	11
Submission of Annual Report by July 1st of each year	5	0
C. Standard Provisions		
Certification and signature of facility operator	3	0

[1] SWPPPs and written monitoring programs were received from 50 and 47 of the 52 selected facilities, respectively.
[2] GISP encourages facility operators to consider structural BMPs *if* the non-structural BMPs chosen are considered insufficient to adequately address the pollutants present. Therefore, the review of structural BMPs was limited to evaluating whether the facility had considered any of the five categories of structural BMPs described in the GISP. For example, it was considered adequate for the purpose of this study if a SWPPP cited that structural BMPs were reviewed and considered but not chosen for implementation because the non-structural BMPs were considered sufficient.

how closely they were involved with preparing their facility's SWPPP. Also, discussions with facility operators during the case study investigations indicated that the facility operators were either unfamiliar or unsure about many BMPs described in their SWPPP. Some facility operators admitted to not fully understanding all aspects of the SWPPP, including the BMPs described, and expressed reservations about their ability to implement certain structural BMPs described in the SWPPP, when it was explained to them what those measures were and the potential consequences for failing to fully implement the SWPPP which they had certified to implement. The lack of or limited facility operator involvement in preparing the facility's SWPPP and in selecting the appropriate BMPs for the facility appears to be one of the main reasons for the disconnect observed between the descriptions provided in a facility's SWPPP and what is actually being implemented in the field.

WRITTEN MONITORING PROGRAMS

How does a facility measure its performance or progress in P2 efforts or gauge the effectiveness of the BMPs implemented? By monitoring. As a requirement of the GISP, facilities must prepare a written monitoring program. The purpose of a written monitoring program is to ensure that proper methods are provided so that facility operators may employ these methods consistently in monitoring their site conditions and the storm water runoff generated from their site. In turn, this would generate monitoring results - both qualitative and quantitative - that are representative of the facility's site conditions and which could provide useful information on a facility's progress over the years.

Out of the 52 requested, 47 auto dismantling facilities submitted their written monitoring programs. The majority of the monitoring programs were prepared by consultants, and had characteristically similar problems as the SWPPPs. Table 4 summarizes some of the deficiencies found in the written monitoring programs per requirements outlined in Section B of the GISP. The documents generally lacked in procedural details explaining how each monitoring activity would be performed. For example, sections on sampling and analysis requirements did not describe the type of sampling equipment to be used, QA/QC procedures, or special precautions needed to provide a well-controlled environment for collecting, storing, and transporting the samples to certified laboratories for analysis. The lack of sufficient procedural details in the written monitoring programs raises questions about the QA/QC procedures used by facilities for their monitoring activities, especially during sample collection, storage, and transport. And this deficiency limits the reliability and the credibility of the storm water analytical data reported in the Annual Reports. Thus, regulators should use the monitoring results provided in the Annual Reports with caution, keeping in mind some of the limitations discussed above. Another flaw observed in a significant number of the monitoring programs is outdated information that fails to reflect the changes included in the 1997 reissued permit. For example, the minimum period required for retaining records increased from 3 years to 5 years in the 1997 permit. However, many monitoring programs still specified 3 years for the minimum required record retention period. Also, many still used the old definition of a wet season (September to April) instead of October through May, as defined in the 1997 permit. Failure to update the SWPPP per new permit conditions affects a facility's ability to comply with the regulatory requirements.

Many of the nine case study facilities that hired consultants to prepare their storm water documents also depended entirely on them to conduct many, if not all, of their monitoring activities. It appears, from discussions with facility operators, that some consultants perform the required monitoring activities alone, unaccompanied by any facility personnel, and provide a written report, summarizing qualitative and/or quantitative monitoring results, to the facility operator at a later time. Although this type of monitoring may technically meet certain regulatory requirement(s), it tends to remove from the facility operator or other key facility personnel the opportunity to fully assess and understand the site conditions first-hand and to seek out the additional steps that may be necessary to make further progress.

Increased compliance assurance activities by regulators, including random audits and formal request of SWPPPs and monitoring programs for review, as well as timely follow-up responses, are some ways to enhance the quality of these storm water documents. In addition, since some of the major problems, including the lack of site-specificity of the documents, are due to the consultants working on these documents, a time-efficient and effective approach would be for the regulating agency to target those few consultants who prepare the documents for the majority in the industry for regular education and training them so that the SWPPPs and the monitoring programs they prepare are up to speed with the GISP requirements. Another recommendation is for the regulating agency to consider the option of requiring all SWPPPs prepared by a third party to be certified to ensure that the details of the monitoring programs selected for implementation have been fully discussed, understood, and agreed upon by facility operators, and that a key facility personnel will conduct or personally accompany the consultant(s) on all of the monitoring activities.

CASE STUDY INVESTIGATIONS: SITE INSPECTIONS

The first and second tiers of compliance establish the foundation for achieving pollution reduction and/or prevention. However, it is only the compliance with the third tier requirements, the onsite implementation, that results in actual pollution abatement and directly impacts water quality. Staff conducted field investigations of nine selected auto dismantling facilities to study their onsite performance.

The field compliance component of the industrial storm water program has generally not been well characterized for the Los Angeles region due to lack of resources available for the GISP program in the past and other competing priorities. However, the general perception is that field compliance is low especially among small facilities. Substantial staff time is required to complete a comprehensive site inspection, which includes pre-inspection preparation, the actual inspection, and post-inspection follow-up activities including completing an inspection report.

Table 5 summarizes some characteristics of the nine case study facilities, including their property size, percent of imperviousness, and the estimated annual vehicle throughput or the number of vehicles processed yearly. Percent imperviousness refers to the portion of a facility property that is paved, roofed (including buildings), or covered. As shown in Table 5, the case study facilities span a wide spectrum in terms of their annual vehicle throughput, property size, and percent imperviousness. One

Table 5. Characterization of Nine Case Study Auto Dismantling Facilities

Facility	Property Size (Acres)	Percent Imperviousness (% Paved, Roofed or Inside Building)	Annual Vehicle Throughput
A	2	60	175 - 250
B	0.7	100	80 - 120
C	2	100	180
D	1	100	50
E	1.5	100	75 - 200 (trucks)
F	0.7	100	120
G	1.5	100	150 (trucks)
H	13	100	16,800
I	0.6	32	110

facility (Facility H) offered "self-service"- i.e. it allows customers to dismantle desired parts directly from the vehicles. The rest of the Facilities, A through G and I, offered retail, "over-the-counter" service and sold already dismantled parts to customers.

Table 6 summarizes some key findings on facility BMP implementation based on staff site inspections. A more complete assessment is presented in Table 7, which provides numerical ratings (from 0 to 3) on how well individual case study facilities implemented the BMPs described in the facility's SWPPPs and other BMPs considered either universally applicable or especially effective for the auto dismantling industry. A facility's overall BMP implementation score -- the sum of individual BMP ratings -- was used to evaluate a possible correlation between a facility's performance and water quality impacts, which is presented in a subsequent section (Appendix B augments Table 7 with the information on the kinds of pollutant sources or activities conducted at each facility and the BMPs that were cited in the facility's SWPPP). The SWPPPs prepared for the nine case study facilities included very similar, overlapping BMPs, primarily consisting of non-structural measures. In general, the findings of this study concur with the trend analyzed in a previous study on the transportation industry by Duke and Chung (1996) that concluded that storm water control measures described similarly in SWPPPs at a number of case study facilities were not uniformly implemented and unequally effective at managing storm water pollutants. As shown in Table 6, some BMPs were more frequently implemented than others.

Table 6. Evaluation of BMPs Implemented at the Nine Case Study Auto Dismantling Facilities

BMP Types	Fully	Partially
Overhead cover for dismantling area	0	3
Cover parts	1	7
2° Containment for fluid-storing container	3	2
Overhead cover for fluid storage	4	3
Pave entire site	7	1
Conduct dismantling on impervious area	8	0

This study also found that BMPs that are more resource-intensive or pose physical constraints on daily operational activities are less likely to be implemented. The structural BMPs cited in the case study facilities' SWPPPs were often missing or if provided at all, were not fully implemented. The first four BMPs that appear in Table 6 (overhead coverage for dismantling and fluid storage areas, coverage for stored part, and secondary containment for fluid storage area) are examples of measures specifically designed to help eliminate or reduce the exposure of pollutant sources to storm water, but yield little apparent tangible benefits for daily operational activities. Only a few facilities successfully implemented these BMPs. More often than not, dismantling activities were conducted outside in an open space, even when a designated roofed area (with three-sided walls) was provided. Staff noticed that one deterrent was the

Table 7. BMP Performance Observed at the Nine Case Study Auto Dismantling Facilities

Activity/ Pollutant Source	Applicable BMPs	BMP Rating[a]								
		A	B	C	D	E	F	G	H	I
Dismantling (includes fluid draining)	Conduct Activity on Impervious area	3	3	3	3	3	3	3	3	0
	Provide overhead cover	1	0	2	0	0	2	0	0	0
	Use drip pan	2	2	3	N/O	N/O	3	1	0	N/O
Parts storage (batteries excluded)	Provide permanent or temporary cover	1	0	2	1	1	2	0	0	3
	Drain most fluids prior to storage	1	2	2	2	2	3	1	1	3
	Store parts off-ground	1	1	2	2	2	3	1	2	3
Battery storage	Remove from vehicle	2	3	3	3	3	3	3	3	3
	Provide 2°containment and cover	2	1	3	3	3	2	0	3	3
Fluid management	Under cover;	1	2	3	3	2	0	0	3	3
	2°containment	1	1	0	0	0	0	3	3	3
Parts Washing/ Cleaning	Indoors or in a covered area	3	0	N/O	0	2	3	2	N/A	2
	Contain wash-water	3	0	N/O	2	2	3	2	N/A	3
Spills/leaks	Use drip pan	2	1	2	2	2	3	1	1	3
	Maintain adequate supply of absorbent	0	0	3	2	2	3	3	2	3
Vehicle storage	Close hood or cover vehicles with engine or oily parts	0	2	2	2	N/O	3	N/O	0	3
	Remove all oily/greasy parts from vehicle (esp. engine, transmission, etc.)	2	3	2	3	3	3	2	0	3
Erosion Potential	Pave entire site	2	3	3	3	3	3	3	3	0
	Use erosion control such as bales of hay or berms (or gravel)	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2
Waste fluid handling	Use appropriate disposal method	N/O	N/O	N/O	N/O	N/O	N/O	N/O	N/O	N/O
Auto compaction	Designated area/pre-drain fluids	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3	N/A
General	Good housekeeping practices	1	1	2	2	2	3	0	2	3
General	Employee training (documented)	0	0	0	0	2	2	0	3	1
General	Inspection (documented)	2	2	2	2	2	2	1	3	2
General	Recordkeeping (copy of GISP, SWPPP, MP, Annual Reports, monitoring records)	1	1	2	1	3	3	1	3	1
General	Storm water treatment	0	0	0	0	2	0	0	2	0
Overall BMP Score		31	27	39	35	38	48	26	34	46

[a] For BMP implementation rating, 0=Not implemented; 1= Poorly implemented; 2= Somewhat poorly implemented; 3= adequately implemented, N/A= not applicable, N/O= Not observed during site inspection.
[b] An overall BMP score is the sum of individual BMP ratings. Two BMPs that were excluded when calculating an overall BMP rating scores. The two BMPs are related to auto compaction activities and recordkeeping activities. Auto compaction-related BMP was left out because eight out of the nine case study facilities did not perform auto compaction and to consider this BMP would necessarily bias the results against the eight facilities. Recordkeeping has a definite indirect contribution toward the successful implementation of a facility's storm water program, but was not included because it is an administrative procedure and in itself does not result in pollution prevention.

insufficient overhead and work space that restricted the movement or the maneuvering of employees during dismantling activities or imposed limitations in forklift-aided transfer of vehicles to and from the designated area. These limitations could have been avoided with a more careful strategic planning of the BMP, that considers adequate work space.

Some BMPs were not implemented by many facilities because of the effort involved in consistently implementing the BMP and other factors. These BMPs include covering parts during storm events and the use of absorbents to control spills. For example, most facilities cited in their SWPPPs that plastic sheets, tarpaulins, or other types of temporary covers would be used to shield vehicle parts from rain. The use of plastic sheets or tarpaulins involves minimal cost for material acquisition but is beset by the following difficulties: (1) unless secured appropriately, tarps or plastic sheets tend to be blown away by wind and provide minimal protection from rain, if any; (2) providing temporary covers depends entirely on the effort of facility employees and are less likely to be implemented consistently and completely, especially under severe storm conditions or if a storm event starts before or after normal business hours; and (3) some facility operators cited other factors, such as tarps placed over the parts storage areas disappearing over night, most likely claimed by itinerant individuals or children in the neighborhood. Given these limitations associated with using temporary covers, facility operators should be strongly encouraged to install permanent roofs or an overhead coverage to effectively reduce exposure of stored parts to precipitation. Another BMP shown to be inconsistently implemented is the use of absorbents to control spills and leaks. Supply maintenance and timely responses are especially crucial for spill-related BMPs. Many case study facilities were deficient in implementing their spill control measures, judging by the degree of spills, leaks, and stains from past spills present on the facility ground. Failure to maintain an adequate supply of spill absorbents on site, the diligent effort required to address small frequent spills, and the lack of urgency that small spills pose compared to large-scale spills are some reasons cited by facility employees for their failure to provide spill control and response measures mentioned in the facility's SWPPPs. Instead of providing immediate attention, many facility employees delayed spill clean-up activities until the end of the business day.

Several major sources contributing oil and grease in storm water runoff were visually identified during the site inspections. Qualitatively judging from the rainbow-colored sheen floating on top of the storm water runoff, failing secondary containment, such as leaky truckbeds used to store incompletely drained parts, fluid-storage areas missing adequate secondary containment or overhead covers, unprotected dismantling areas, and auto compaction location appeared to be the principal sources introducing high levels of oil and grease into storm water from the case study facilities. All of these sources represent areas associated with principal industrial activities.

A recommendation based on these site inspection observations is to provide both an overhead coverage and an adequate (secondary) containment for areas associated with principal industrial activities. Conducting all activities inside a building or roofed, bermed (or curbed) areas would really help minimize or eliminate the introduction of pollutants into storm water runoff. To maximize the usefulness of these structural BMPs, adequate working space and overhead room are two critical factors that need to be considered in the planning stage of these BMPs. There are BMPs such as storing well-drained parts in large autobodies (as observed at Facility I) that allows facility operators to use materials readily available onsite and does not necessitate building a structure. However, this type of BMP, to be effectively implemented, requires extra effort and vigilance on the part of the facility staff (and are thus less likely to be implemented successfully) since parts must be thoroughly drained prior to being placed inside the autobodies, as opposed to parts stored in bermed areas which prevent runoff of residual fluids. Some specific measures to protect the fluid storage areas that have been shown to be effective in the field include a combination of providing an overhead roof or a clean solid board (placed on top of fluid-storing drums) along with the use of sealed, flat-bottom truckbeds, berms, or a secondary drum large enough to fit another drum inside. Secondary drums should preferably be filled with sand or other spill absorbent material, and sufficiently large and low enough so that the inner fluid-containing drum could easily be transported in and out using a forklift.

The primary cause of significant spills observed during auto compaction is incomplete draining of fluids from parts that remain on the vehicles. Facility H, the only case study facility that conducted auto compaction activities, removed most cores (unwanted parts) prior to vehicle compaction after customers had a chance to claim the desired parts. Based on the substantial spills observed during its auto compaction process, the facility apparently had neglected to completely drain residual fluids from the parts remaining on the vehicles, causing fluids to jet out well beyond the surrounding berm during the compaction process. Complete fluid draining upon vehicle arrival is crucial to preventing spills generated during vehicle staging or compaction process.

Many BMPs must be implemented in combination with other BMPs to be effective. A set of BMPs that appears to be especially effective when implemented together is secondary containment and overhead coverage as mentioned above. Overhead coverage helps to eliminate the exposure of pollutants to storm water runoff but not for spills traveling away from, for example, a roofed fluid-storage area. Similarly, severe storms could flood uncovered, bermed areas and introduce pollutants to storm water runoff. When combined, these BMPs could effectively reduce pollutant contact with storm water. Few facilities provided both of these BMPs for the same source area.

Other BMPs implemented by the case study facilities (storing parts off-ground or removing greasy parts from vehicles) by themselves offer minimal or limited pollution control. For example, mounting partially-drained parts or fluid-storing drums on wooden pallets could appear to reduce contact with storm water runoff; however, spills and leaks generated during parts or fluid transfer typically flow over the pallets and contaminate the site ground and make contact with storm water. Mounting fluid-storing drums on top of pallets does not help contain spills and leaks and is not a secondary containment measure, contrary to the claims of some facility operators. Even when parts are fully drained before being placed on pallets, they must be provided with adequate cover to minimize exposure to storm water. Site pavement, which is considered as a stand-alone solution to controlling sediment in storm water, could only offer some degree of control of solids in storm water when facilities have poor housekeeping practices. Facility B had the entire site paved, but the level of total suspended solids (TSS) in its storm water samples substantially exceeded the USEPA benchmark for this constituent. In fact, the facility's TSS level was comparable to other case study facilities with partial or almost no site pavement. A potential source of sediment in storm water generated from completely paved sites is soil from vehicle tires or customers' shoes.

Several factors were considered in identifying potential reasons for the varying degree of BMP implementation observed at the nine case study facilities. The number of employees, facility size, and annual vehicle throughput did not appear to correlate well with a facility's ability to effectively implement BMPs for facilities with five or less personnel, of two acres or less, or with yearly vehicle throughput of less than 300. The eight facilities that fell within this category demonstrated significant differences in their BMP implementation efforts. Facility H, with 16,800 annual vehicle throughput and a 13-acre site, provided several environmentally-trained personnel onsite, maintained efficient recordkeeping, offered regular training for all its employees, and provided storm water treatment, including an oil and water separator for a portion of the site's storm water runoff and an adequate supply of excelsior in the primary discharge location. However, because of the small study pool, with only one facility of this caliber, it is difficult to arrive at a conclusion as to whether facilities with greater resources are more likely to fully implement their BMPs and other storm water program requirements. The performance of this facility could very well have been compelled by an aggressive third-party lawsuit launched by a local non-profit environmental organization against the facility in the recent past.

Cultural or language barriers and the lack of public outreach were identified as two potential reasons for the deficient BMP implementation. The different ethnic backgrounds represented among auto dismantlers in Los Angeles County include Armenian, Mexican, Korean, Persian, and Caucasian, with the first two groups representing the dominant ethnic groups in some areas. From phone conversations and discussions from the site inspections, it became apparent that many of the ethnic minorities did not fully understand the GISP instructions and some had trouble following the verbal instructions of staff. This may partially explain the apparent disconnect between the consultant-prepared SWPPPs and the actual implementation of BMPs onsite. Many of the case study facility operators displayed complete ignorance and a sense of apathy about the significance of storm water pollution, and complained about having to pay for the discharge of naturally-occurring storm water, clearly missing the key point that it is the *pollution* in the storm water runoff that they are responsible for.

One of the key findings of this present study based on the staff's site-inspection experiences is that determining onsite compliance can be rather challenging and not very straightforward for both dischargers and regulators. This is especially true for facilities that are not grossly deficient or sloppy in their housekeeping or operational practices. More accurately, if compliance is to be defined to ensure protection of waterbodies and to prohibit contributing to possible excursion of all applicable water quality standards, as is stated in the GISP, the task of accurately assessing compliance becomes even more daunting because of the following three reasons.

First, the GISP does not specify a mandatory, minimum set of BMPs that must be implemented by all permittees or by each industry. The GISP basically states that facility operators should *consider* the different categories of BMPs outlined in the permit and then select and implement appropriate BMPs to attain the Best Available

Technology (BAT) level. However, the permit does not define what the BAT level is or how to demonstrate that the BAT level has been ascertained. Therefore, facility operators belonging to the same industry may choose from a range of different BMPs - either a single, highly effective BMP, such as treatment, or a combination of multiple BMPs whose cumulative impact may be equally effective. The P2 approach with its primary reliance on facility operators to identify and implement site-specific solutions offers flexibility and room for economic considerations. However, it also presents difficulties for those charged with the responsibility of assessing whether the BMPs provided and as implemented are sufficiently adequate to ensure that the facility's storm water discharges are not contributing to or causing exceedances of water quality standards. There is still limited information on the effectiveness of specific BMPs or the cumulative effects of combined BMPs. And to leave this task of compliance determination up to the individual operator's judgement seems to be questionable regulatory policy.

Secondly, there are no numerical effluent limitations in the GISP, with the exception of a small group of facilities specified under USEPA regulations (40 CFR Subchapter N), that could provide a clear, objective standard for compliance for all regulated facilities across industries. In the absence of a quantifiable measure of compliance, site inspections can, at most, point out whether certain BMPs in a facility's SWPPP are being implemented and identify evidence of pollution, including spills and leaks, that could visually indicate a facility's overall BMP effectiveness. However, to be able to link (visual) compliance with water quality impacts, one must come up with a quantifiable or numeric compliance standard based on water quality criteria.

Thirdly, not all BMPs are readily observable, in particular the non-structural ones when the activities targeted are not being performed. Thus, the implementation status of certain BMPs can be difficult to determine for individuals not part of the facility since site inspections provide only a snapshot in time of the facility's performance. Examples of such BMPs include preventative maintenance of equipment (unless records are maintained on file) or if special caution is employed for certain operating procedures.

Clearly, the overall success of a facility's BMP implementation efforts could qualitatively be judged based on the evidence of pollution, such as spills and stains. However, such qualitative assessment necessarily introduces the subjectivity of the observer and is prone to different interpretations about how well the facilities may be complying with the intent and the requirements of the GISP. As the saying goes, "how clean is clean?" Should facilities feel "safe" as long as they provide reasonably adequate housekeeping (but according to whose standard?) and maintain an overall neat appearance, or do they need to make sure their site is meticulous? Are facilities considered to be in compliance as long as the BMPs provided in the SWPPP are being implemented, or would they be penalized for choosing BMPs inadequate for their activities? Of course, the use of a "common sense" approach and close interaction with the regulating agency could help facilities to move forward. However, for all these efforts of the regulators and permittees to pay off or result in substantially improved water quality, there must be some type of clear quantifiable standards of compliance that could be enforced.

In conclusion, BMPs indicated in the SWPPPs were not fully implemented at the nine case study facilities. Some facilities performed their storm water control measures more diligently than others. Individual BMPs are unequally effective in controlling storm water pollution. As expected, areas associated with principal industrial activities appear to be the major contributors of oil and grease, and probably other pollutants as well, and should be provided with appropriate overhead coverage and secondary containment. Structural BMPs must be planned strategically-- taking into account the need for adequate work space and other conditions that would facilitate the daily operational activities-- to be utilized effectively by employees. Awareness of the significance of storm water pollution and the need for pollution controls appeared to be low among many of the facility operators. Language barriers and the lack of field presence of regulators and of timely enforcement actions in the past are some reasons for the lack of compliance observed among auto dismantling facilities. From a regulatory perspective, because each SWPPP is required to be certified by the facility operators under perjury of law, failure to implement the BMPs described in a facility's SWPPP automatically places a facility in violation of the GISP requirements; consequently, all nine facilities were out of compliance since they did not fully implement all the BMPs indicated in their SWPPP.

However, what is troubling is that, in addition to BMPs not being fully implemented, the list of BMPs drawn up by consultants or facility operators may not be sufficient to control the type and the level of pollutants generated from a site. Therefore, the need to provide a clear, verifiable standard for compliance in the permit, either in the form of (or a combination of) a set of minimum or baseline BMPs or numerical effluent limitations, is incumbent upon the regulators to make the compliance assessment process more understandable to both the regulating agency and the regulated community. Lastly, BMPs applicable to the auto dismantling industry that may be considered effective in the field, and BMPs cited in other storm water manuals, are summarized in Appendix C.

So far, we have focused on the compliance status of selected auto dismantling facilities. The next section explores the water quality implications associated with these findings.

CASE STUDY INVESTIGATIONS: STORM WATER SAMPLING & ANALYSIS

This section focuses on the quantitative measurement of P2 efforts - i.e. storm water analytical data. Storm water samples were collected from eight case study facilities between November 1998 and April 1999. (Due to storm water infiltration into the unpaved facility ground, Facility I did not generate any visible runoff during the several storm events that staff visited the site). Except for Facilities A and B where staff obtained samples from two separate storm events, one set of grab samples was collected from each facility. The goal of collecting samples from the case study facilities was to provide a small, well-controlled sampling program to evaluate the following: a) the range of pollutant concentrations in storm water runoff generated from the industry; b) the overall effect of BMPs implemented by different case study facilities; and c) comparison of the agency-monitored data with the self-reported data provided in the Annual Report for some facilities. Using the USEPA benchmark values as a reference, this study evaluated the levels of pollutants in storm water runoff from eight of the nine case study facilities. This section also provides a trend analysis of pollutant levels in storm water runoff reported over several years by one facility. The storm water analytical data for the eight case study facilities are presented in Table 8. The first column of Table 8 lists the constituents analyzed (auto dismantling facilities in the Los Angeles region must analyze for all constituents listed, except for iron and aluminum; facilities in most other regions in California are required to analyze for iron and aluminum and not copper and zinc.). The last column provides the USEPA benchmark values for the corresponding constituents for reference purposes.

Table 8. Storm Water Analytical Results for Eight Case Study Auto Dismantling Facilities[1]

(Los Angeles County, 1998/99)

CONSTITUENT	EPA Method	Reporting Limit	**FACILITY**										USEPA Benchmark Level[3]
			A1[2] 2/9/99[5]	**A[2]** 4/11/99	**B1[2]** 2/9/99	**B2[2]** 4/11/99	**C** 2/9/99	**D** 4/6/99	**E** 2/9/99	**F** 3/25/99	**G** 4/6/99	**H** 3/25/99	
pH	150.1	0.1	7.7	7.6	9	7.9	7.4	7.2	7.3	6.8	6.2	8.0	**6-9**
Total Suspended Solids (mg/L)	160.2	10	81	292	210	183	86	83	38	40	70	202	**100**
Specific Conductance (µmho/cm)	120.1	20	248	271	334	217	264	226	39	79	89	395	**200**
Oil & Grease (mg/L)	413.1	1	62	73	22	11	25	11	12	18	11	65	**15**
Copper (µg/L)	G/F[4]	10/50	259	204	134	67	157	128	106	79	92	238	**63.6**
Lead (µg/L)	G/F	10/200	70	51	284	187	104	153	96	62	35	69	**81.6**
Zinc (µg/L)	F	50	400	507	754	766	456	659	362	539	509	330	**117**
Aluminum (mg/L)	G/F	10/1000	812	< 1000	2032	< 1000	867	< 1000	837	< 1000	< 1000	3090	**750**
Iron (mg/L)	F	100	1170	1140	3440	1100	1320	890	1285	320	590	2800	**1000**

1 Grab samples of storm water runoff were collected from eight auto dismantling facilities in the San Gabriel River and the Los Angeles River watersheds
2 For Facilities A and B, staff collected samples from two storm events.
3 The Parameter Benchmark Values are from the USEPA Multi-sector Permit (USEPA 1995)
4 G= graphite method, F= flame method.
5 Indicates sample collection date.

None of the facilities successfully met the USEPA benchmarks for all constituents analyzed. This is not surprising since the median and the mean pollutant concentrations estimated based on past monitoring data submitted by auto dismantling facilities in their Annual Reports (from 1995/96 to 1997/98) generally exceeded the benchmark values (Appendix D). Shading in Table 8 represent excursions of the benchmark levels. Except for pH, benchmark values for all the other constituents analyzed were exceeded by at least one case study facility. Two constituents that appeared to present the most challenge for the case study facilities were copper and zinc, as demonstrated by the fact that none of the facilities were able to achieve the benchmark levels specified for those constituents. Benchmark levels for specific conductance, oil & grease, aluminum, and iron were exceeded by five (not necessarily the same) facilities (aluminum and iron are not required to be monitored by this industry). Three and four excursions of the benchmark levels were noted for TSS and lead, respectively. Facilities, E and F, whose analytical data indicated relatively lower pollutant concentrations overall, are two facilities which appeared more organized and had signs of good housekeeping practices.

Storm water analytical monitoring data demonstrated a substantial degree of variability between facilities, storm events, and sampling events. For the eight case study facilities, pollutant concentrations or measurements varied by more than a factor of seven for TSS, ten for specific conductance (SC), six for oil & grease (O&G), four for copper (Cu), ten for iron (Fe), eight for lead (Pb), and two for zinc (Zn). The lows and highs in the pollutant concentration range were: 6.8 and 9.0 for pH, 38 and 292 (mg/L) for TSS, 39 and 395 (µmho/com) for specific conductance, 11 and 73 (mg/L) for oil & grease, 812 and 3090 (µg/L) for aluminum, 67 and 259 (µg/L) for copper, 320 and 1170 (µg/L) for iron, 35 and 284 (µg/L) for lead, and 330 and 766 (µg/L) for zinc (some results for aluminum reported as < 1000 µg/L could be less than 812.).

Some interesting trends were observed in the self-monitored storm water analytical data (reported by the case study facilities) for samples collected over multiple years, for a given wet season, and on the same day. Figures 4 through 10, which evaluated the data reported by Facility H for the period between 1993 to 1999, clearly demonstrate the stochastic nature of storm water runoff. No clear increasing or decreasing trend in pollutant concentrations over time is recognized.

An analysis involving five sets of data generated by Facility H for the 1998/99 wet season demonstrated that the highs and the lows in pollutant concentrations of storm water from one facility could vary substantially for a given wet season: by more than a factor of seven for TSS, two for specific conductance, five for oil & grease, three for lead, twelve for aluminum, four for iron, and two for chemical oxygen demand (Facility H had submitted five sets of data for the wet year 1998/99). Again, no consistent trend of increase or decrease was observed in the data set spanning one wet season.

Table 9. Comparison of Pollutant Concentrations in Storm Water Samples Collected on Same Day by Different Individuals for Two Case Study Auto Dismantling Facilities.

Constituents	Facility B (sampled on 2/9/99)		Facility H (sampled on 3/25/99)	
	Facility	Staff	Facility	Staff
pH	9	9	7.42	8
TSS (mg/L)	100	210	183	202
SC (µmho/cm)	160	334	487	395
O&G (mg/L)	9	22	17	65
Pb (mg/L)	0.085	0.284	0.1	0.069
Cu (mg/L)	0.44	0.134	0.21	0.238
Zn (mg/L)	0.3	0.754	0.28	0.33
Al (mg/L)	N/A	N/A	0.21	3.09
Fe (mg/L)	N/A	N/A	4.8	2.8

We evaluated two sites (Facilities B and H) where the facility operator and our staff collected the storm water samples on the same day to determine the extent of variation in pollutant concentrations for samples collected on the same day. Table 9 compares the analytical data reported by the facility versus agency staff. Analytical results on Facilities B and H demonstrated that storm water samples taken on the same day by different individuals, in this case by RWQCB staff and by facility personnel, can display quite different results. Facility H's data (where staff collected samples immediately after a facility employees completed his sampling for the facility) indicated that the reported concentration for the following five constituents (TSS, specific conductance, oil & grease, lead,

Figure 4.   Total Suspended Solids in Storm Water Runoff from an Auto Dismantling Facility

(Case Study Facility H; Monterey Park, CA; Self-reported data for 1993 ~ 1999)

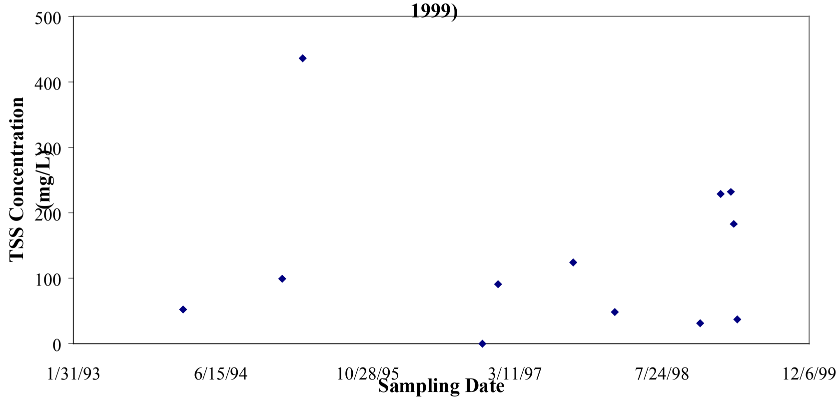


Figure 5. Specific Conductance in Storm Water Runoff from an Auto Dismantling Facility

(Case Study Facility H; Monterey Park; Self-reported data for 1993 ~ 1999)

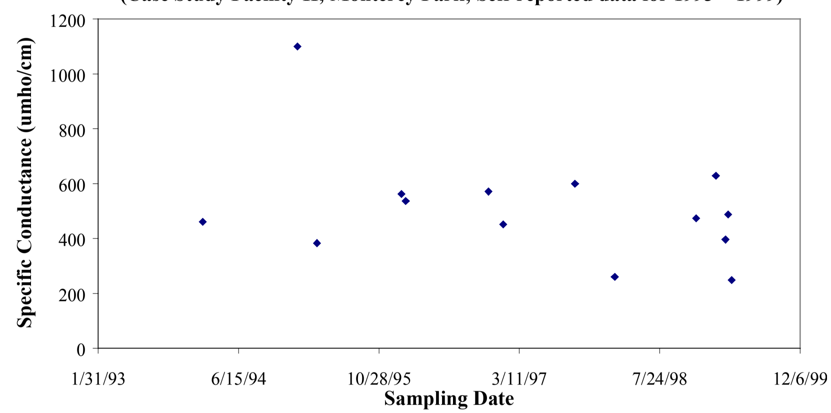


Figure 6. Oil & Grease in Storm Water Runoff from an Auto Dismantling Facility

(Case Study Facility H; Monterey Park, CA; Self-reported data for 1992 ~ 1999)

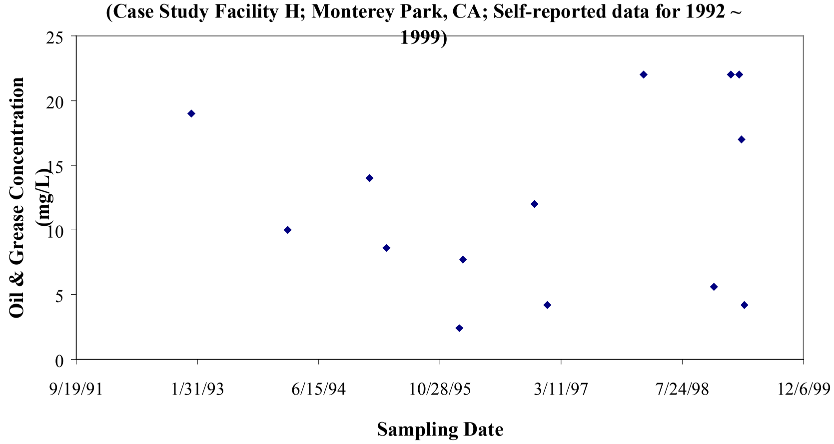


Figure 7. Lead in Storm Water Runoff from an Auto Dismantling Facility

(Case Study Facility H; Monterey Park, CA; Self-reported data for 1996 ~ 1999)

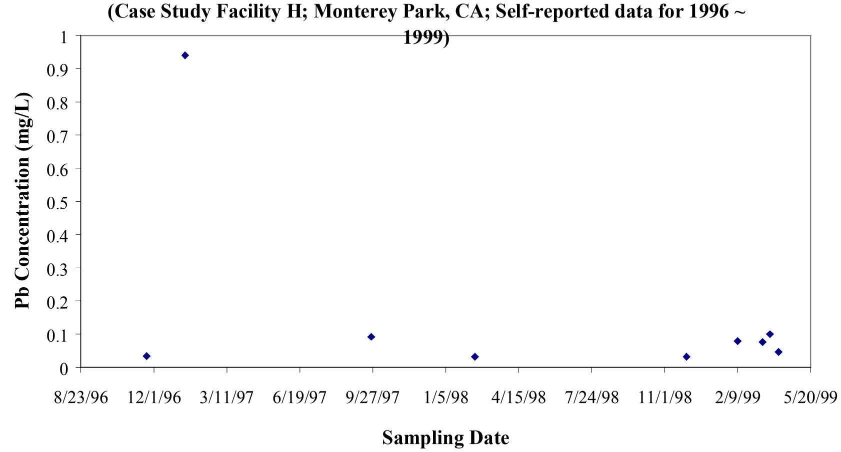


Figure 8. Copper in Storm Water Runoff from an Auto Dismantling Facility

(Case Study Facility H; Monterey Park, CA; Self-reported data for 1996 ~ 1999)

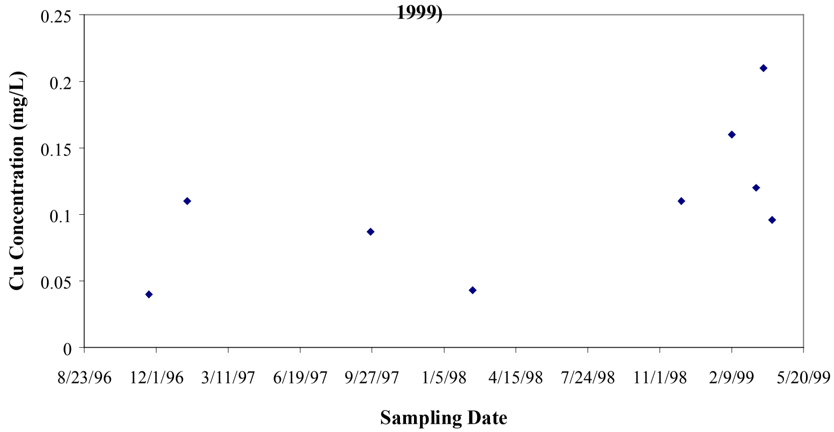


Figure 9. Zinc in Storm Water Runoff from an Auto Dismantling Facility

(Case Study Facility H; Monterey Park, CA; Self-reported data for 1996 ~ 1999)

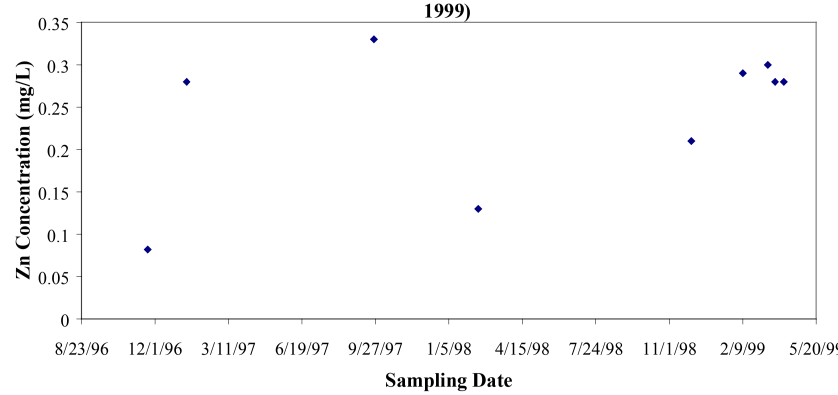
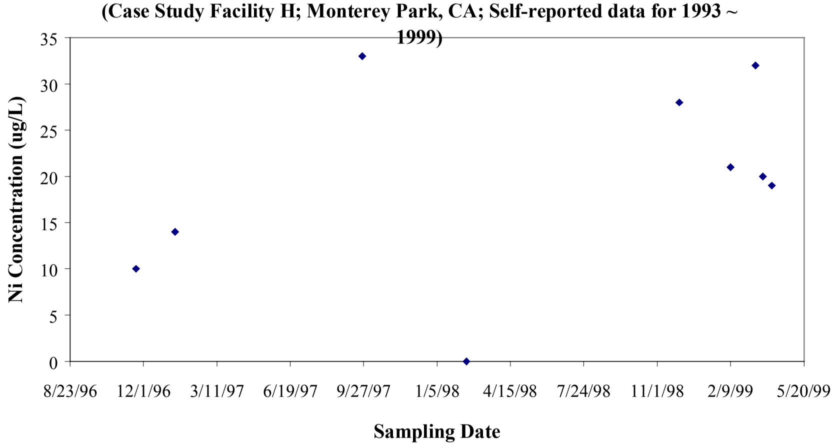


Figure 10. Nickel in Storm Water Runoff from an Auto Dismantling Facility

(Case Study Facility H; Monterey Park, CA; Self-reported data for 1993 ~ 1999)



copper, and zinc) differed by at least 20% and up to 1400% between the two sets of data, with the most significant differences observed for oil & grease (280%), and for aluminum (1400%). An interesting trend observed with Facility B's data was that for five out of the six constituents (TSS, specific conductance, oil & grease, lead, and zinc) agency-generated data were higher than the facility's self-reported data by at least 100% and up to 230%. This suggests that perhaps different sampling strategies -- agency staff attempted to capture storm water runoff with a visible oily sheen -- could produce substantially different results, even for a same-day sampling.

One of the goals of storm water sampling at the case study facilities was to provide a well-controlled sampling environment with an adequate QA/QC necessary to generate reliable data that could be used to relate meaningfully the effects of BMPs on water quality. Two methods were used to relate BMP implementation to pollutant concentrations in storm water runoff. The first method attempted to evaluate the overall BMP implementation scores of each facility, derived based on a systematic rating system, in the context of storm water concentrations. The second method used the overall site appearance or impression as a qualitative indicator of the relative concentration of pollutants in storm water runoff.

With the first method, we tested for both linearity (r) and causality (r^2) between BMP implementation and storm water concentration by plotting for each constituent the pollutant concentration against the overall BMP score of each facility (The overall BMP scores are presented in Table 7.) The r and r^2 values were all less than 0.5 and 0.25, respectively. This implies that a mathematical relationship of the type employed in this study may not be a suitable method for relating the effects of BMPs with the runoff quality, based on the results of our case study. Possible reasons that a clear relationship between overall BMP score and the pollutant concentrations were not observed include:

- the chosen method does not take into account the degree of effectiveness of individual BMPs (this study rated the BMPs only on how completely or satisfactorily each BMP was implemented at the facilities, and summed the ratings to obtain an overall BMP score. This is essentially equivalent to assuming that all BMPs are equally effective and assigining them equal weights);

- site-specific factors, such as annual vehicle throughput; when the last batch of vehicles arrived and were dismantled; how many storm events preceded the sampling activity; and the time lapsed between the start of a rain and a sampling event, and rainfall intensity, are not considered by the above method.

It should be noted that due to the short duration of storm events and the lack of staff to cover all eight case study facilities at the same time, sampling was collected over three separate events between February and April of 1999. The inspections were performed between November of 1998 and April of 1999.

The overall site appearance or evidence of diligent implementation of good housekeeping practices seems to be a useful indicator of the relative pollutant levels between sites with similar facility size, annual throughput, and operational activities. Generally, case study facilities that were organized and clean showed relatively lower pollutant concentration levels, with the exception of one site (Facility G). Storm water samples from Facilities A and B, on average, showed much higher pollutant concentrations than those from Facilities E and F. Facilities A and B were prime examples of sites with negligent housekeeping activities, prevalent spills on the ground, and little or no coverage provided for greasy parts. Facilities E and F had a relatively organized site, had minimal spills on the ground, and appeared to segregate parts (greasy parts stored indoors or protected from rain).

Facility G was conspicuously one of the dirtier facilities with prevalent spills and greasy parts covering the facility ground. Surprisingly, the facility had relatively low pollutant concentrations in its storm water samples. The facility had the following physical characteristics that could have contributed to masking or obscuring the effects of pollution present onsite. The facility ground had many depressions, which reduced the amount of runoff and created pools of standing water. The surface grade of this facility was not uniform, resulting not in sheet flow traveling in one direction but runoff meandering and exiting the site in multiple directions. Indeed, there was some runoff from the facility, but the hydraulic gradient of the facility was such that there was no single primary discharge point. The challenge was in determining whether the samples being collected were representative of runoff from areas of principal industrial activities. The uncharacteristically low pollutant concentrations imply that the samples were probably not representative of general site conditions. To rely only on one set of perhaps not-so-representative analytical results to judge the adequacy of one's BMP performance would be a major oversight in this case because the results do not accurately reflect the site conditions.

The above example points to some of the difficulties in collecting representative samples and the importance of not only obtaining indicative samples but also being able to properly interpret analytical results in the context of conditions under which sampling was conducted. One solution is to obtain grab samples from every discharge location to obtain representative samples. Although the GISP requires facilities to obtain samples representative of the site conditions (multiple sets if necessary), self-reported data submitted as part of the Annual Reports indicate that nearly all facilities that perform any sampling at all only obtain one set of samples for each storm event (For some facilities with only one primary discharge location, one set of grab samples may suffice.)

In conclusion, there is a substantial degree of variation in the pollutant levels in storm water samples from facilities conducting similar industrial activities. The observed trend between BMP implementation and storm water quality is that a more diligent implementation of (a greater number of) BMPs is likely to result in a lower pollutant concentration. The storm water programs, as implemented by the eight case study facilities, failed to attain the USEPA benchmark levels for most constituents. It is unclear whether the benchmark levels could have been met had the facilities diligently implemented *all* the BMPs described in their SWPPPs, or if additional BMPs would have been required. A more clear standard of compliance is needed in the GISP. The GISP should either specify a measurable endpoint -- either by establishing a minimum set of baseline BMPs to be implemented or by providing numerical effluent limitations- that could be used to demonstrate whether a facility has attained the desired BAT level and has indeed achieved compliance.

Now, how does all this relate to water quality impacts on receiving waterbodies? Here we turn our attention to pollutant loads.

POLLUTANT LOADS

Load estimates are necessary to accurately assess the potential impact of various sources of pollution on receiving waterbodies. In this section we evaluated the storm water-related load contributed by auto dismantling facilities in Los Angeles County. The following mathematical equation known as the EPA Simple Method was used to estimate the range of loads generated from the auto dismantling industry in the form of storm water pollution (Chandler 1994):

$$L = 0.227*P*Pj*A*C(0.05 + 0.009*I)$$

Parameters considered in load estimates include pollutant concentrations, rainfall intensity, and other site- and or industry-specific physical parameters. Loads were estimated for individual watersheds in Los Angeles County.

For the purpose of this study, rather than calculating the load for each individual site and then adding the loads to obtain an estimate for an entire watershed, we used a simpler approach by using average values for pollutant concentration, site percent imperviousness, and facility size based on self-reported information available in the RWQCB's NOI database or in the facility's SWPPP. For area, A, area occupied per watershed by auto dismantling establishments was estimated by multiplying the following three factors: a) the total number of auto dismantlers in Los Angeles County (404) estimated earlier in this study; b) the proportion of auto dismantling facilities located in each watershed area, determined based on zip codes of all dismantlers with an active NOI; and c) the average size of auto dismantling facilities located in each watershed. Precipitation information was obtained from Los Angeles County Department of Public Works, Hydrology Division. Precipitation of 0.1 inch was considered as the threshold or the minimum rainfall needed to generate runoff. One or two reference monitoring sites were chosen per watershed to determine the annual precipitation and runoff volume specific to each watershed. Appendix E provides more details on how each parameter was derived.

Although the EPA Simple Method specifies that flow-weighted concentrations should be used, this study used the storm water analytical data for the grab samples collected by RWQCB staff from the eight case study facilities for two primary reasons. First, there are no known flow-weighted (pollutant) composite data of storm water runoff from auto dismantling sites that reflect the climatic and precipitation patterns of Southern California. Second, the agency data was generated using reliable and replicable QA/QC procedures, which makes it more useful than self-reported data submitted by facilities with unknown QA/QC.

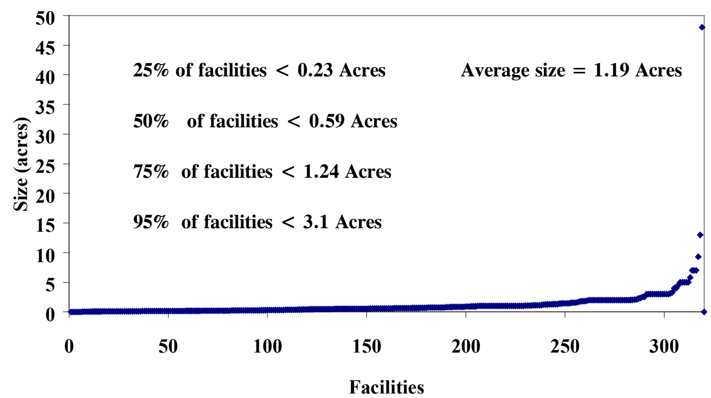
Table 10 summarizes the geographical distribution and the average size of auto dismantling facilities in Los Angeles County per watershed. As of August 1999, approximately 58% of the auto dismantlers in Los Angeles County were located in the Los Angeles River watershed; 25% in the Dominguez Channel watershed; 16% in the

Table 10. Geographical Distribution and Average Size of Auto Dismantling Facilities in Individual Watersheds in Los Angeles County.

Watershed	Estimated number of auto dismantling facilities	Average facility size (acres)	Estimated total source area (acres)
Los Angeles River	234 (57.8%)	1.215	284 (63%)
Dominguez Channel	103 (25.4%)	0937	96 (21%)
San Gabriel River	63 (15.6%)	1.06	67 (15%)
Santa Clara River	2 (0.6%)	1.31	3.2 (0.7%)
Santa Monica Bay	2 (0.6%)	0.2	0.4 (0.08%)
Total Source Area	404	1.12*	450

*county average

Figure 11. Size Distribution of Auto Dismantler Facilities in Los Angeles County



San Gabriel watershed; and 0.6% each in the Santa Clara River watershed and the Santa Monica Bay watershed. Figure 11 shows the size distribution of auto dismantling facilities in Los Angeles County. The County average is 1.2 acres, with 90% of the facilities under 3 acres.

Pollutant loads from the auto dismantling industry were estimated for the 1998 - 1999 storm year for the three watersheds with the highest number of auto dismantling facilities - Los Angeles River, San Gabriel River, and Dominguez Channel. Loads were calculated for TSS, oil & grease, copper, lead, and zinc. Table 11 presents the load estimates and information on parameters used to arrive at the estimates, such as average pollutant concentration, annual precipitation and runoff, and area within each watershed occupied by auto dismantling facilities. The total approximate loads for all of Los Angeles County contributed by the auto dismantling industry are: 22,950 lbs. of TSS, 5,600 lbs. of oil & grease, 30 lbs. of copper, 20 lbs. of lead, and 100 lbs. of zinc. These estimates may be slightly lower than for a typical wet season because the 1998/99 wet season was impacted by the La Niña phenomenon and had less-than-average

Table 11. Pollutant Load per Watershed Contributed by Auto Dismantling Industry in Los Angeles County based on the 1998/99 Wet Year (pounds) [1]

Watershed	P[2] (in)	Pj[3]	TSS 116.3 mg/L[4]	O&G 28.4 mg/L	Cu 142 ug/L	Pb 103 ug/L	Zn 508 ug/L
Los Angeles River (284 Acres)	9.72[5]	0.72	22,950	5,600	30	20	100
Dominguez Channel (96 Acres)	4.71[6]	0.67	3,480	850	4	3	15
San Gabriel River (67 Acres)	7.48[7]	0.72	4,140	1,010	5	4	18
Total			30,570	7,460	40	30	130

[1] Based on average site imperviousness value of 43%. Rainfall data for the 1998/99 wet year (Oct. – Oct.) was obtained for specific reference sites within each watershed from the Los Angeles County, Department of Public Works, Hydrology Division.
[2] P is annual precipitation in inches per year.
[3] Pj is fraction of rainfall events that produce pollutants in runoff. Pj was calculated using an assumption that the threshold rainfall greater than 0.1 inches is needed to produce runoff.
[4] Average pollutant concentrations were estimated based on the storm water analytical data on the grab samples collected by RWQCB staff from the eight case study auto dismantling facilities.
[5] Rainfall data from the monitoring stations near Downtown Los Angeles and Sun Valley.
[6] Rainfall data from the monitoring station near Wilmington.
[7] Rainfall data from the monitoring station near Duarte.

precipitation. On a watershed level, the Los Angeles River was the single most impacted waterbody, receiving the majority of the load. The San Gabriel River watershed, which has a smaller total "source" area than Dominguez Channel watershed, was characterized with a higher load due to the greater total precipitation and runoff experienced in the San Gabriel watershed area. Although not presented in Table 10, the loads from the auto dismantling facilities in the Santa Monica Bay watershed and the Santa Clara River watersheds are negligible given the fact that each watershed only had two known auto dismantling businesses within its respective area.

The load introduced by the auto dismantling industry to surface waters is significant. On a weight basis, the pollutant associated with the highest load by weight is TSS, followed by oil & grease, zinc, lead and copper. The estimates presented in this study may be improved by using flow-weighted composite data for pollutant concentration, accounting for the variability in the rainfall patterns within specific watersheds, and by using a more accurate estimate of the total universe of facilities that accounts for facilities that both the RWQCB and DMV failed to capture. For a more meaningful load analysis, the estimates should be evaluated in the context of loads generated from other major industrial sources, a task that lies outside the scope of this study.

CONSIDERATION OF OTHER APPROACHES TO STORM WATER POLLUTION CONTROL

The question of how compliance should be defined to protect water quality and beneficial uses of the receiving waterbody is an important one. The pollution prevention approach, as currently designed, lacks a clear, uniform standard for measuring compliance, and may require more resources than traditional (individual) NPDES to adequately monitor for compliance. An objective quantitative or measurable standard of compliance is also necessary for equitable and consistent enforcement. Two alternatives other than the current P2 approach are considered in this section. One alternative is to define compliance in terms of numerical effluent limitations. This approach is consistent with the traditional or individual NPDES permitting approach. Establishing numerical effluent limitations would help facility operators to determine whether the facility is indeed achieving the limits, and if not, how much the facility needs to ratchet down its pollutant levels to return to compliance. This simplifies compliance assessment for both regulators and the regulated community and provides a clear basis for enforcement actions. If feasible, numerical effluent limitations should be developed based on water quality criteria that are protective of beneficial uses. This would ensure that facilities, by meeting the established limitations, are not contributing to or causing exceedances of applicable water quality standards.

Another alternative is to prescribe a set of minimum, mandatory baseline BMPs for each industry. Compliance would be determined primarily by the effective and diligent implementation of these selected BMPs. To facilitate the compliance determination process, a minimum set of BMPs should consist of measures that are readily observable. This option limits the flexibility offered by the P2 approach that allows facility operators the freedom to choose from a wide range of BMPs and to tailor the BMPs to the facility's site and economic conditions. In addition to Appendix C and the sources cited for Appendix C, the list of BMPs compiled for the cooperative compliance program of Wisconsin is another comprehensive source of information on BMPs for the auto dismantling industry (KES 1999; CCP/DNR 1999)

This study recommends the following tiered approach for the auto dismantling industry that combines the core of the two alternatives outlined above: 1) a mandatory set of specific, baseline structural and non-structural BMPs for facilities with annual vehicle throughput of less than 500 (which represent "mom-and-pop" facilities); and 2) mandatory treatment of storm water for facilities with annual vehicle throughput greater than 500. Also, in lieu of requiring treatment, numerical effluent limitations could be applied to the latter group as a standard of compliance. A compliance schedule could help phase facilities into compliance over a certain specified time frame. Facilities with less than 500 annual vehicle throughput that persistently demonstrate problems in meeting certain water quality standards, for example the USEPA benchmark levels, should also be considered for mandatory storm water treatment.

Lack of sufficient resources has been identified as the primary reason for the limited compliance assurance and enforcement activities by the RWQCB. One way to help effectively implement the above recommended strategy and at the same time, reduce the workload associated with compliance assessment and assurance activities is to employ a semi-privatized certification program, such as that implemented in the State of Wisconsin, which relies on licensed, private inspectors to oversee the compliance activities of a group of facilities that voluntarily choose to participate and help fund the program. The aim of such a program is to help reduce some of the workload of the regulators and to allow facilities that diligently work toward and maintain a specified level of compliance to be certified for compliance by professional inspectors. Such certification could potentially shield them from certain regulatory responsibilities, such as monitoring activities, and indirectly from third-party lawsuits by reducing the degree of their environmental liability. (Essential to the implementation of this type of program is regular training and (re-)certification of inspectors by the regulating agency to maintain high QA/QC for the inspection procedures.)

V. CONCLUSIONS/RECOMMENDATIONS

Several conclusions can be drawn from the findings of this study. Compliance, in general, appears to be limited or low among the auto dismantling facilities in Los Angeles County, for all three tiers of the GISP requirements. Analyses based on site visits results and DMV dismantling license information showed that about one out of every five auto dismantling facilities operating in Los Angeles County are non-filers. Compliance with the annual reporting and SWPPP and written monitoring program requirements is also limited. Review of the 1997/98 Annual Reports revealed that many of the required facilities failed to conduct the key monitoring activities, such as storm water sampling and analysis, limiting the usefulness of the Annual Reports as a tool to gauge overall permittee performance. SWPPPs and written monitoring programs, due to their generally poor quality, fail to effectively guide facility operators in their P2 efforts and in proper monitoring procedures. Accelerated enforcement activities have proven to be effective for increasing the Annual Report submittal rate. Outreach to consultants is strongly recommended to upgrade or improve the quality of SWPPPs and written monitoring programs being prepared by third parties.

The GISP program has not effectively penetrated the auto dismantling industry in terms of compelling the kinds of behavioral changes needed to effectively control storm water pollution and to improve water quality. Case study investigations indicated that the selected facilities failed to select and implement appropriate BMPs to attain the USEPA benchmark levels. Pollutant load estimates based on this industry show that the magnitude of the load could be substantial. These findings imply that the current approach based on P2 and the primary reliance on facility operators to identify and implement appropriate BMPs, without establishing enforceable numerical effluent limitations, has not been shown to be effective, at least at the level currently implemented, in controlling storm water runoff from the auto dismantling industry. Past studies on other industries, including the metal plating and transportation sectors, support some of the findings and conclusions of this study (Duke and. Shaver 1999; Duke et al 1999a; Duke et al 1999b; Duke et al 1998; Duke and Bauersachs 1998; Duke et al 1998; Duke and Beswick 1997; and Duke and Chung 1996).

The lack of a clear, objective standard for compliance could pose a special challenge to dischargers when trying to determine if the existing BMPs are sufficient or need to be upgraded or supplemented with additional BMPs. The majority of the storm water analytical data from the eight case study facilities and the self-reported data provided by auto dismantling facilities in the past substantially exceeded the USEPA benchmark values. The GISP program, as currently implemented and enforced, appears to be not attaining the potential pollution reduction achievable as envisioned. For this reason, this study considered different regulatory alternatives to control industrial storm water pollution. This study recommends a tiered approach that offers different combinations of options -- including implementation of a set of minimum required BMPs, mandatory storm water treatment, or applying numerical effluent limitations -- based on each facility's annual vehicle throughput quantity.

Until now, the GISP program at the Los Angeles RWQCB has exhausted most of its resources for determining and enforcing against violators of the first and second tier compliance. In reality, it is the onsite implementation that actually achieves pollution prevention or reduction. Therefore, more resources should be allocated to assess and verify field compliance. Increase in compliance assurance activities and timely comprehensive enforcement activities would improve overall compliance. This study suggests a possible solution -- a semi-privatized compliance certification program -- that could substantially reduce regulators' workload and allow them to focus on high-risk sectors or facilities to more effectively regulate and control storm water pollution associated with industrial activities.

References

AB 1186. 1997. California Assembly Member Wally Knox (D-Los Angeles). *Amendment to Water Code Section 13260. Chapter 775 of the Statutes of 1997.*

AB 2019. 1998. California Assembly Member Sheila Kuehl (D- Santa Monica). *Amendment to Water Code Section 13320 Chapter **5.9** of the Statutes of 1998.*

ARA. 1997. *Best Management Practices for the Auto Dismantling Industry*. Automotive Recyclers Association (ARA), Fairfax Virginia, 1996 & 1997

Bay, S., B. H. Jones., and K. Schiff. 1999. *Study of the Impact of Stormwater Discharge on Santa Monica Bay*. Executive Summary. University of Southern California Sea Grant USCSG-TR-02-99.

CCP/DNR 1999. *Best Management Practices for Dismantling of Vehicles for Parts Selling and Salvage*. Certification Compliance Program/Department of Natural Resources (CCP/DNR) for WPDES Permit No. WI-S059145. DNR approved October 1, 1999. 10 pages.

Chandler, R. D. 1994. Estimating Annual Urban Nonpoint Pollutant Loads. *Journal of Management in Engineering*. November/December 1994. pp. 50-59.

Chang, H. C. 2001. Assessing Effectiveness of Storm Water Regulations for Industry: Regulatory Compliance and Water Quality Implications in the Auto Dismantling Industry. Los Angeles, California. Doctoral Dissertation. Environmental Science and Engineering Program. University of California, Los Angeles.

DMV. 1999. *Summary Printout of Automobile Dismantler Operations in California*. 08/99 Transmittal, California Department of Motor Vehicles, Occupational Licensing Division, Case Assignment Records Unit, Sacramento, CA.

Duke, L. D. and K. A. Shaver. 1999. Widespread Failure to Comply with U.S. Storm Water Regulations For Industry: Part II: Facility-Level Evaluations to Estimate Number of Regulated Facilities. *Environmental Engineering Science* 16(4): 249-263.

Duke, L. D., K. P. Coleman, and B. Masek 1999a. Widespread Failure to Comply with U.S. Storm Water Regulations For Industry: Part I: Publicly-Available Data to Estimate Number of Potentially Regulated Facilities. *Environmental Engineering Science* 16(4): 229-247.

Duke, L. D. and L. A. Bauersachs 1998. Compliance with storm water pollution prevention regulations. *Journal of the American Water Resources Association* 34(1):1-12.

Duke, L. D., M. Buffleben, and L. A. Bauersachs. 1998. Pollutants in Storm Water Runoff from Metal Plating Facilities, Los Angeles, California. *Waste Management* 18(1998) 25-38.

Duke, L. D. and P. G. Beswick. 1997. Industry Compliance with Storm Water Pollution Prevention Regulations: The Case of Transportation Industry Facilities in California and the Los Angeles Region. *Water Resources Bulletin* 33(4):825-838.

Duke, L. D. and Y. J. Chung. 1996. Industrial Storm Water Pollution Prevention: Effectiveness and Limitations of Source Controls in the Transportation Industry. *Waste Management* 15(8): 532-558.

Duke, L. D., C. Y., Y. J. Chung, K. A. Shaver, K. P. Coleman, B. Masek, M. A. Yeager, L. Ganse, N. Meck, C. Lewis, C. R. Jones, T. Sax, and K. Zayed. 1999b. *Storm Water General Industrial Permit Non-Filer Identification and Communication Project*. Final Report to California State Water Resource Control Board, USEPA CWA § 104(b)(3) grant, contract no. 5-096-250-0, September 1999. 150 pages.

Duke, L. Donald; Shaver, Kathleen A.; Burnam, Joshua L.; Sax, Todd P.; and Augustenborg, Cara A., 2000. *Industrial Storm Water Discharger Identification and Compliance Evaluation in the City of Los Angeles*. Draft Final Report to California State Water Resources Control Board, June 2000. 100 pages.

GISP. 1997. *Waste Discharge Requirements (WDRS) for Discharges of Storm Water Associated with Industrial Activities Excluding Construction Activities, Water Quality Order No. 97-03-DWQ. National Pollutant Discharge Elimination System (NPDES), General Permit No. CAS000001*. State Water Resource Control Board, Sacramento, California.

HTB. 1998. *Omission Accomplished: The Lack of a Regional Water Board Enforcement Program, 1992-1997.* Report. Heal the Bay, Santa Monica, California.

KES. 1999. *Storm Water Manual: Automotive Recyclers, Cooperative Compliance Program of Wisconsin, Inc*. Partnership with the Wisconsin Department of Natural Resources. Kendziorski Environmental Services, Inc. (First published in 1999; Periodically updated; Received by RWQCB staff in 2000).

LADPW. 1998. Critical Source Study: BMPs for the Auto Dismantler Industry. Los Angeles County Department of Public Works.

MPCA. 1994. *Motor Vehicle Salvage Facility Environmental Compliance Manual*. The Minnesota Pollution Control Agency/ Ground Water and Solid Waste Division/ Site Response Section. St. Paul, Minnesota.

NRDC. 2000. *Petition to Correct Deficiencies or Withdraw EPA Approval; Delegated Clean Water Act Authority; Storm Water, Los Angeles Regional Water Quality Control Board (40 C.F.R. § 123.64)*. National Resources Defense Council. February 23, 2000.

RWQCB. 1998. *Analysis of the Sampling Results: 1997-1997 Annual Report for Storm Water Industrial Activities General Permit*. Final Draft. California Regional Water Quality Control Board- Los Angeles Region. Monterey Park, California.

Swamikannu, X. 1994. Auto Recycler and Dismantler Facilities: Environmental Analysis of the Industry with a Focus on Storm Water Pollution. University of California, Los Angeles, *Doctoral Dissertation*.

TWA. 2000. *Watershed 103: Manual for Training TMDL Practitioners*. Training Workshop by The Watershed Academy. Sponsored by USEPA. Office of Wetlands, Oceans, and Watersheds, USEPA- Region 9, and State Water Resource Control Board. Riverside, California.

USEPA. 2000a. Preliminary Audit Results of Los Angeles Regional Water Quality Control Board Storm Water Enforcement Program. USEPA- Region 9. National Audit of State Enforcement. USEPA Office of Inspector General. September 2000.

USEPA. 2000b. *Final National Pollutant Discharge Elimination System Storm Water Multi-Sector General Permit for Industrial Activities*. Federal Register 65(210):64746-64880 (October 30), U.S. General Services Administration, National Archives and Records Service, Office of the Federal Register, Washington, D.C.

USEPA. 1998. EPA NPDES Program Implementation Review- Final Report; Los Angeles Regional Water Quality Control Board. USEPA- Region 9. Office of the Regional Administrator

USEPA. 1996. *Interim Permitting Approach for Water Quality-based Effluent Limitations in Storm Water Permits*. Memo from Assistant Administrator to EPA Water Management Division Directors. August 1, 1996.

USEPA. 1995. *Final National Pollutant Discharge Elimination System Storm Water Multi-Sector General Permit for Industrial Activities*. Federal Register 60(189):50803-51319 (September 29), U.S. General Services Administration, National Archives and Records Service, Office of the Federal Register, Washington, D.C.

WEF. 1996. *Effectiveness of Industrial Storm Water General Permitting Program.* Final Report. EPA Cooperative Agreement No. CX 823667-01. General Permit Review Program No. 4315. Water Environment Federation.

Appendix A. Storm Water Pollution Prevention Plan and Monitoring Program Review Checklist

GENERAL INDUSTRIAL ACTIVITIES STORM WATER PERMIT
WATER QUALITY ORDER NO. 97-03-DWQ

FACILITY NAME ________________________________

WDID# 4 ____________________ REVIEW DATE ____________________

FACILITY CONTACT		CONSULTANT CONTACT	
Name	______	Name	______
Title	______	Title	______
Company	______	Company	______
Street Address	______	Street Address	______
City, State	______	City, State	______
Zip	______	Zip	______

Indication of WDID#	☐ **YES**	☐ **NO**

STORM WATER POLLUTION PREVENTION PLAN		**Not Applicable**	**Included**	**Not Included**	**Incomplete**	**Comments**
Signed Certification	**(C.9 and C.10)**					
Pollution Prevention Team	**(A.3.a)**					
Existing Facility Plans	**(A.3.b)**					
Facility Site Map(s)						
Facility boundaries	(A.4.a)					
Drainage areas	(A.4.a)					
Direction of flow	(A.4.a)					
Onsite water bodies	(A.4.a)					
Areas of soil erosion	(A.4.a)					
Nearby water bodies	(A.4.a)					
Municipal storm drain inlets	(A.4.a)					
Points of discharge	(A.4.b)					
Structural control measures	(A.4.b)					
Impervious areas (paved areas, buildings, covered areas, roofed areas)	(A.4.c)					
Location of directly exposed materials	(A.4.d)					
Locations of significant spills and leaks	(A.4.d)					
Storage areas / Storage tanks	(A.4.e)					
Shipping and receiving areas	(A.4.e)					
Fueling areas	(A.4.e)					
Vehicle and equipment storage and maintenance	(A.4.e)					
Material handling / Material processing	(A.4.e)					
Waste treatment / Waste disposal	(A.4.e)					
Dust generation / Particulate generation	(A.4.e)					
Cleaning areas / Rinsing areas	(A.4.e)					
Other areas of industrial activities	(A.4.e)					

Items in parentheses refer to specific sections of the General Permit

Reviewer ____________________

Appendix A (cont'd)

STORM WATER POLLUTION PREVENTION PLAN		Not Applicable	Included	Not Included	Incomplete	Comments
List of Significant Materials For each material listed:	**(A.5)**					
Storage location						
Receiving and shipping location						
Handling location						
Quantity						
Frequency						
Description of Potential Pollution Sources	**(A.6)**					
Industrial processes	(A.6.a.i)					
Material handling and storage areas	(A.6.a.ii)					
Dust and particulate generating activities	(A.6.a.iii)					
Significant spills and leaks	(A.6.a.iv)					
Non-storm water discharges	(A.6.a.v)					
Soil erosion	(A.6.a.vi)					
Assessment of Potential Pollutant Sources	**(A.7)**					
Areas likely to be sources of pollutants	(A.7.a.i)					
Pollutants likely to be present	(A.7.a.ii)					
Storm Water Best Management Practices	**(A.8)**					
Existing BMPs						
Existing BMPs to be revised and/or implemented						
New BMPs to be implemented						
Non-structural BMPs	**(A.8.a)**					
Good housekeeping	(A.8.a.i)					
Preventative maintenance	(A.8.a.ii)					
Spill response	(A.8.a.iii)					
Material handling and storage	(A.8.a.iv)					
Employee training	(A.8.a.v)					
Waste handling / Waste recycling	(A.8.a.vi)					
Recordkeeping and internal reporting	(A.8.a.vii)					
Erosion control and site stabilization	(A.8.a.viii)					
Inspections	(A.8.a.ix)					
Quality assurance	(A.8.a.x)					
Structural BMPs	**(A.8.b)**					
Overhead coverage	(A.8.b.i)					
Retention ponds	(A.8.b.ii)					
Control devices	(A.8.b.iii)					
Secondary containment structures	(A.8.b.iv)					
Treatment	(A.8.b.v)					
Annual Comprehensive Site Compliance Evaluation						
Review of visual observations, inspections, and sampling analysis	(A.9.a)					
Visual inspection of potential pollution sources	(A.9.b)					
Review and evaluation of BMPs	(A.9.c)					
Evaluation report	(A.9.d)					

Appendix A (cont'd)

MONITORING PROGRAM	Not Applicable	Included	Not Included	Incomplete	Comments
Quarterly Non-Storm Water Discharge Visual Observations (B.3)					
Observations to be conducted (B.3.c) (Jan-March, April-June, July-September, October-December)					
All drainage areas (B.3.a)					
Look for presence of unauthorized NSWDs (B.3.a)					
Observe authorized NSWDs (B.3.b)					
Maintain observation records (B.3.d)					
Storm Water Discharge Visual Observations (B.4)					
Once per month during wet season (B.4.a) (October 1-May 31)					
Observe during first hour of discharge (B.4.a)					
All drainage areas (B.4.a)					
Observe stored or contained storm water at time of discharge (B.4.a)					
Preceded by three working days dry weather (B.4.c)					
Document discharge characteristics (B.4.c)					
Sampling and Analysis					
Samples to be collected during first hour of discharge (B.5.a)					
Sample from first storm of the wet season (B.5.a)					
Sample from one additional storm during wet season (B.5.a)					
Samples collected from all discharge locations (B.5.a)					
Sampling of contained storm water at time of discharge (B.5.a)					
Sampling preceded by at least three working days without storm water discharges (B.5.b)					
Sampling for pH, TSS, SC, TOC or O&G (B.5.c.i)					
Sampling for toxic chemicals and other pollutants likely present in storm water discharges in significant quantities (B.5.c.ii)					
Other analytical parameters listed in Table D (B.5.c.iii)					
Storm Water Effluent Limitation Guidelines parameters (B.6)					
Description of sampling locations (B.7)					
Description of sampling methods (B.10)					
Identification of analytical methods and method detection limits (B.10.b)					
Retention of all records for at least five years (B.13)					
Annual Report to be submitted by July 1 each year (B.14)					

General Comments: ____
____
____
____

Appendix B. Summary of Site Inspection Results : Verification of Facility-specific Activities and BMPs

Type of Activity/ Pollutant source	Activity or pollutant sources present onsite?[1]									Applicable BMPs	BMP Indicated in Facility's SWPPP?									Level at Which BMP Implemented at Facility[2]								
	A	B	C	D	E	F	G	H	I		A	B	C	D	E	F	G	H	I	A	B	C	D	E	F	G	H	I
Dismantling (includes fluid draining)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Conduct Activity on Impervious area	Y	Y	Y	Y	Y	Y	Y	Y	N	3	3	3	3	3	3	3	3	0
										Provide overhead cover	N	N	Y	N	N	Y	Y	N	N	1	0	2	0	0	2	0	0	0
										Use drip pan	Y	Y	Y	Y	Y	Y	Y	Y	Y	2	2	3	N/O	N/O	3	1	0	N/O
Parts storage (batteries excluded)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Provide permanent or temporary cover	Y	Y	Y	Y	Y	Y	Y	Y	Y	1	0	2	1	1	2	0	0	3
										Drain most fluids prior to storage	Y	Y	Y	Y	Y	Y	Y	Y	Y	1	2	2	2	2	3	1	1	3
										Store parts off-ground	Y	Y	Y	Y	Y	Y	Y	Y	Y	1	1	2	2	2	3	1	2	3
Battery storage	Y	Y	Y	Y	Y	Y	Y	Y	Y	Remove from vehicle	Y	Y	Y	Y	Y	Y	Y	Y	Y	2	3	3	3	3	3	3	3	3
										Provide 2°containment and cover	Y	Y	Y	Y	Y	Y	Y	Y	Y	2	1	3	3	3	2	0	3	3
Fluid management	Y	Y	Y	Y	Y	Y	Y	Y	Y	Under cover;	Y	Y	Y	Y	Y	Y	Y	Y	Y	1	2	3	3	2	0	0	3	3
										2°containment	Y	Y	Y	Y	Y	Y	Y	Y	Y	1	1	0	0	0	0	3	3	3
Parts Washing/ Cleaning	Y	Y	N/O	Y	Y	Y	Y	N	Y	Indoors or in a covered area	Y	N	N	Y	Y	Y	Y	N/A	Y	3	0	N/O	0	2	3	2	N/A	2
										Contain wash-water	Y	N/A	N/A	Y	Y	Y	Y	N/A	Y	3	0	N/O	2	2	3	2	N/A	3
Spills/leaks*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Use drip pan	Y	Y	Y	Y	Y	Y	Y	Y	Y	2	1	2	2	2	3	1	1	3
										Maintain adequate supply of absorbent	Y	Y	Y	Y	Y	Y	Y	Y	Y	0	0	3	2	2	3	3	2	3
Vehicle storage	Y	Y	Y	Y	Y	Y	Y	Y	Y	Close hood or cover vehicles with engine or oily parts	Y	Y	Y	Y	Y	Y	Y	Y	Y	0	2	2	2	N/O	3	N/O	0	3
										Remove all oily/greasy parts from vehicle (esp. engine, transmission, etc.)	Y	Y	Y	Y	Y	Y	Y	Y	Y	2	3	2	3	3	3	2	0	3
Erosion Potential	Y	N	N	N	N	N	N	N	Y	Pave entire site	N	Y	Y	Y	Y	Y	Y	Y	N	2	3	3	3	3	3	3	3	0
										Use erosion control such as bales of hay or berms (or gravel)	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Y	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2
Waste fluid handling	Y	Y	Y	Y	Y	Y	Y	Y	Y	Use appropriate disposal method	Y	Y	Y	Y	Y	Y	Y	Y	Y	N/O	N/O	N/O	N/O	N/O	N/O	N/O	N/O	N/O
Auto compaction	N	N	N	N	N	N	N	Y	N	Designated area/pre-drain fluids	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3	N/A
General										Use erosion control such as bales of hay or berms (or gravel)	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Y	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2
General										Good housekeeping practices	Y	Y	Y	Y	Y	Y	Y	Y	Y	1	1	2	2	2	3	0	2	3
General										Employee training (documented)	Y	Y	Y	Y	Y	Y	Y	Y	Y	0	0	0	0	2	2	0	3	1
General										Inspection (documented)	Y	Y	Y	Y	Y	Y	Y	Y	Y	2	2	2	2	2	2	1	3	2
General										Recordkeeping	Y	Y	Y	Y	Y	Y	Y	Y	Y	1	1	2	1	3	3	1	3	1
General										Storm water treatment	N	N	N	N	Y	N	N	Y	N	0	0	0	0	2	0	0	2	0

[1] Y= yes, N= no; N/A= not applicable.

[2] For BMP implementation rating, 0=Not implemented; 1= Poorly implemented; 2= Somewhat poorly implemented; 3= adequately implemented, N/A= not applicable, N/O= Not observed during site inspection.

Appendix C. Best Management Practices for Auto Dismantling Industry

ACTIVITY	PURPOSE	BEST MANAGEMENT PRACTICES (BMPs)
Vehicle Dismantling Dismantling Activities	Eliminate exposure	• Roof or cover to eliminate rain-in. Berm area to eliminate storm water run-on. Conduct dismantling work in this designated area. • Place a mat, plastic, or tarpaulin on the ground prior to placing parts on the ground. (Also, if no roof or cover provided over dismantling area, conduct dismantling activities on top of plastic or tarpaulin, which can be readily cleaned or replaced, and removed during storm events). • Drain all fluids (antifreeze/coolant, brake fluid, gasoline/diesel, motor oil, transmission oil) from vehicle prior to dismantling and parts removal. • Use drip pans to drain fluids. Do not overfill . • Drain oil filters before disposal/recycling. • Remove refrigerant prior to dismantling and parts removal. • Deploy airbags per guidelines or remove intact airbags for reuse and store under cover. • Dispose of greasy rags, air filters, spent coolant, and degreasers. • Remove batteries promptly after vehicle arrival. • Remove oil-bearing components prior to storage.
Fluid draining	Eliminate exposure	• Roof or cover to eliminate rain-in. Berm area to eliminate storm water run-on. Remove fluids in this designated area. • Use drip pans for draining vehicular fluid. • Use funnels, and stoppers for the containers. • Avoid discharge of vehicular fluid (as in drips or leaks) on the ground.
Parts Repair/ Wash	Eliminate exposure	• Designate contained areas for repairs and washing (curb, berm or dike area, if necessary. If not feasible, use oleophilic (oil- absorbing) boom bags to prevent washwater from running to the street / curb or other areas of facility.) • Wash parts in a wash- tray provided with secondary containment. • If area not otherwise contained, divert runoff from repair and wash areas with hydrophobic boom bags. • Transfer spent solvent or washwater into designated drums. • Recycle and reuse or release washwaters to sanitary sewer. • Use minimum amounts of solvents or detergents for parts cleaning. • Use water-based cleaning solvents and biodegradable (non-phosphate) detergents. • Wipe and sweep area regularly after activity. Dispose of greasy rags, air filters, spent coolant, and degreasers in appropriate containers.
Storage Vehicles	Eliminate exposure	• Keep vehicle engines covered with hoods or with plastic sheets secured in place. • Store vehicles on an impervious (e.g. concrete) surface (if possible). • Use drip pans under stored vehicles. • Minimize inventory during wet season. • Reduce holding time for scrap disposal.

Appendix C. Best Management Practices for Auto Dismantling Industry (Cont'd)

ACTIVITY	PURPOSE	BEST MANAGEMENT PRACTICES (BMPs)
Separated components	Eliminate exposure	• Confine to designated area. • Store indoors or under temporary or permanent cover (that sufficiently shields rainfall). • Curb, berm, or dike the area. (If not feasible, then: 1) store parts off-ground, for example on storage racks, with drip pans underneath to collect residual fluids; or 2) store parts in leak-free truck beds or plastic containers; or 3) place parts in auto bodies (intact), especially large-sized vans, which also provide an excellent storage places for parts; 4) divert runoff from scrap storage area with hydrophobic (water resistant) boom bags) • Place tires in semi-trailers, indoors, or covered area. Sell or recycle. • Store scrap parts/metals under cover and dispose of to scrap collector promptly • Divert runoff from scrap storage area with hydrophobic (water resistant) boom bags.
Batteries	Eliminate exposure	• Store batteries in covered storage area, on a paved surface that is bermed, or in plastic containers with lids.
Fluid	Eliminate exposure Improve materials management	• Store fluid containers (e.g. drums) on an impervious surface and under a roofed shed. • Provide secondary containment for the fluid-containing drums. • Keep separate (solvents, oils and fuel) and label accordingly.
<u>Others</u> Recycling	Waste minimization	• Recycle (or resell if possible) anti-freeze, fuel, waste oil, windshield washer and solvents. • Recycle usable recyclable parts. • Recycle tires and core/ scrap metals.
Spill Prevention & Clean-up	Minimize exposure Waste Minimization Contain/ cleanup pollutants	• Employee training (prepare for and clean up spills.) • Prepare a spill clean-up kit (absorbent sand, rags, adsorbent snakes, broom, etc.) and place in convenient readily accessible location. • Drain vehicular fluids at designated removal area. • Use the provided spill- kit to contain leaks or spills immediately. Dispose of properly. (Use oleophilic sands to absorb/contain small leaks, and boom bags for large spills.)
Employee Training	Waste minimization	• Train employees regularly in proper and environmentally safe practices.
Customer Education	Waste minimization	• Inform and require customers who remove parts to do so properly and appropriately dispose of waste (for example, posting signs that require the use of drip pans for parts removal and prohibit waste-generating activities in parking lot can be helpful).
Site Inspection	Good maintenance	• Inspect site regularly to ensure all appropriate BMPs are being implemented.
Preventative maintenance	Prevent pollution/ accidents	• Inspect to ensure integrity of tanks, containers, pipings and valves. Install safeguards against accidental release.

Appendix C. Best Management Practices for Auto Dismantling Industry (Cont'd)

ACTIVITY	PURPOSE	BEST MANAGEMENT PRACTICES (BMPs)
Site Maintenance	Minimize exposure	• Keep site clear of trash and debris. • Regularly remove and sweep sand (used to contain spills), trash or dirt from site. • Collect corrosion/ metal particles with magnet (survey the site with a forklift or small vehicle with magnet attached behind.)
Materials Inventory	Good management	• Maintain proper inventories of vehicles processed, materials stored, and wastes recycled or disposed of.
Site grading	Minimize exposure	• Repave area to direct flows to a low point (away from storage and waste areas) where leaking fluids can be collected.
Recordskeeping	Good management	• Maintain records of inspections, monitoring (including storm water sampling), Annual Reports, and training.
Storm Water Treatment Flow dissipation	Remove Pollutants	• Direct flow discharge over coarse gravel or cobblestones to facilitate settling out of particulates and sediment.
Vegetative belts	Remove Pollutants	• Direct flow discharge over vegetative belts or biofilters to enhance pollutant removal.
Sand/ gravel filters	Remove Pollutants	• Allow storm water from open parts storage areas to pass through sand-gravel filter with drain holes. Sand layer must be periodically replaced.
Detention ponds	Remove Pollutants	• Capture storm water runoff from high activity areas. Skim off surface oil and remove bottom sediment. Reuse or evaporate runoff water.
Oil-grit/ oil-water separator	Remove Pollutants	• Direct flows from high activity areas through OW separators. Off-line separators to bypass large storms are preferable. Maintain regularly.
Flotation/ coagulation	Remove Pollutants	• Store runoff flows, equalize, and provide flotation/ coagulation. High operation and maintenance costs. Inappropriate if used only intermittently.
Industrial sewer piping	Remove Pollutants offsite	• Pretreat as required and pipe to sanitary sewer if allowed (permit likely required).
Oil/grease - absorbents	Remove Pollutants	• Provide oleophilic booms or excelsior near runoff exit. Replace as needed. Dispose of properly.

References:

1. ARA 1997
2. LADPW 1998
3. MPCA 1994.
4. Swamikannu 1994
5. USEPA 1995

Appendix D. Comparison of Conventional and Toxic Pollutant Concentrations in Storm Water from Auto Dismantling Facilities in Los Angeles Region [1]

Constituents	EPA Bench-mark[2]	L.A. RWQCB[3] N=8; 1998 –1999			L.A. RWQCB[4] N=24; 1997 – 1998			L.A. RWQCB[4] N=49; 1996 – 1997			L.A. RWQCB[5] 1995 - 1996		
		Mean	Median	95ile	Mean	Median	95ile	Mean	Median	95ile	Mean	Median	95ile
pH	**6-9**	6.2 (min)	7.3	8.5 (max)	6.15 (min)	7	8.74 (max)	1.81 (min)	6.8	8.9 (max)	5.7 (min)	6.8	7.8 (max)
TSS	**100**	116	85	210	99	69	304	196	51	479	148	168	294
SC (umho/cm)	**200**	204	243	355	196	135	518	415	170	1530	262	160	623
O&G	**15**	28	18	67	N=20 8.7	6.7	20.1	11	7.7	30	39 (N=3)	15	92
TOC	**110**	N/A	N/A	N/A	N=7 78	110	138	N/A	N/A	N/A	45 (N=12)	32	122
Al	**0.75**	1.06	0.668	2.53	N=2 1.19	1.19	1.65	N/A	N/A	N/A	N/A	N/A	N/A
Cu	**0.0636**	0.142	0.132	0.236	0.09	0.093	0.17	0.170	0.17	.245	N/A	N/A	N/A
Fe	**1**	1.36	1.22	2.71	N=2 2.36	2.19	3.19	N/A	N/A	N/A	N/A	N/A	N/A
Pb	**0.0816**	0.103	0.083	0.210	0.06	0.035	0.2	0.304	0.267	0.682	0.174 (N=7)	0.15	0.34
Zn	**0.117**	0.509	0.483	0.725	0.56	0.34	1.9	1.07	0.40	2.75	N/A	N/A	N/A

1 Data represent grab samples of storm water from auto dismantling facilities collected by facility operators as part of the annual monitoring and reporting requirement or by the RWQCB staff as part of this study.
2 The benchmark values are from the 1995 USEPA Multi-sector Permit (USPEA 1995).
3 Represent samples collected by staff from the eight case study facilities.
4 Represent samples collected by facility operators.
5 Represent samples collected by group monitoring participants.

Appendix E. Description of Load Estimate Parameters

Each of the parameters in the EPA Simple Method equation were estimated as described below:

Average pollutant concentration, C: Ideally, Flow-weighted composites should be used to estimate load. Given the lack of flow-weighted composite storm water data on the auto dismantling industry reflective of the climatic and precipitation patterns of Southern California, grab sample data generated by staff sampling at the eight case study facilities were used. At this time, the approximate margin of error or uncertainty from using grab sample data instead of flow-weighted composite data is not known.

The total site area, A: For area, A, area occupied per watershed by auto dismantling establishments were estimated by multiplying the following three factors: a) the total number of auto dismantlers in Los Angeles County (404) estimated earlier in this study; b) the proportion of auto dismantling facilities located in each watershed area, determined based on zipcodes of all dismantlers with an active NOI; and c) the average size of auto dismantling facilities located in each watershed. It was assumed that, on average, non-filers are similar to NOI filers in size and in spatial distribution.

Annual rainfall depth, P: Rainfall records for certain parts of Los Angeles County were available from the Los Angeles County Department of Public Works, Hydrology Division (the County). This study chose reference monitoring sites chosen for each watershed with a significant number of auto dismantler establishments. Rainfall pattern could vary substantially even within a watershed. Therefore, it is important to use rainfall data as specific or closest to the source area as possible. The annual rainfall depth was calculated by adding daily rainfall (in inches) reported from October 1998 to September 1999.

Fraction of rainfall events that produce a runoff, Pj: This study used 0.1 inches as the threshold volume required to generate runoff. Pj was calculated by dividing the sum of the adjusted individual rainfall volume (i.e. minus the first 0.1 inches) for the 1998/99 wet season by the annual total rainfall volume. If Pj is known for a given geographical area for a certain wet season or for an extended period (for example 100 years), one could reasonably estimate the total annual runoff (by multiplying $P*P_j$) without the individual rain records as long as the annual total precipitation is known. Since the daily rainfall data were available from the County, we calculated the product P*Pj by simply adding the individual rainfall depth after subtracting 0.1 inch from each rainfall datum.

Site Imperviousness, I: The GISP defines percent imperviousness as the portion of a facility property that is paved, roofed (including buildings), or covered. A single value for imperviousness was derived by normalizing based on area, i.e. by dividing the sum of impervious areas calculated for each facility by the sum of facility size. An average site imperviousness of 43% was estimated for the auto dismantling facilities in Los Angeles County using the self-reported information in the NOI database (This value is significantly less than the 76% imperviousness estimated for light industrial land use in the Los Angeles County's Annual Monitoring Report submitted as a requirement under the municipal storm water program.) A source of uncertainty in this estimate is that facility operators could have misinterpreted the term "imperviousness."